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AN ECONOMIC INVESTIGATION OF THE MONTANE TUSSOCK-GRASSLAND OF NEW ZEALAND.

VI. FURTHER DETAILS REGARDING THE RELATIVE PALATABILITY FOR SHEEP OF VARIOUS PASTURE-PLANTS.

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GENERAL.

TO the June, 1919, number of this *Journal* I contributed an account of an experiment conducted by me during the previous month of January, which was designed to pave the way for future experiments regarding the relative palatability for sheep of the various plants now composing the grassland of the South Island back-country sheep-stations. The experiment was carried out on the Conical Hill Reserve, Hanmer Springs, which is 25 acres in area, and at its highest point 1,770 ft. above sea-level. The plant covering of the reserve consists at its lower part chiefly of cocksfoot (*Dactylis glomerata*) and sweet vernal (*Anthoxanthum odoratum*), but the upper portion—the greater part of the area—is tussock-grassland similar in character to that which clothes the adjacent mountains up to a height of some 3,000 ft., and is closely related to the montane grassland of the South Island in general.

FIG. 1. GENERAL VIEW OF CONICAL HILL, SHOWING THE AMOUNT OF GROUND OCCUPIED BY TREES.

FIG. 2. A PURE STAND OF SWEET-VERNAL GRASS ON THE HILL.

This was cropped by the sheep as closely as if it had been mown. The tussocks of *Festuca novae-zelandiae* are untouched.

[*Photos, W. D. Reid.*

The experiment consisted in the grazing of the reserve of 281 rams during a period of nine days, and observing exactly not merely which plants they ate and which they did not eat, but also paying special attention to the exact sequence in which the various plants were eaten. Obviously nine days was too short a time in which to procure full information regarding the relative palatability of all the plants; also the results obtained refer only to the class of pasture represented by that of Conical Hill as it then was under the climatic conditions of the particular season. Nevertheless, certain matters of general interest came to the front which indicated that much more research might be profitably carried out on the same lines, while it became evident that a good deal of current opinion regarding the palatability of well-known pasture-plants might not merely require modification but be erroneous. It also stood out clearly that much more knowledge was required regarding the value as sheep-feed of the following common pasture plants: Fescue-tussock (*Festuca novae-zelandiae*), poa-tusosck (*Poa caespitosa*), blue-tussock (*Poa Colensoi*—in its various unnamed varieties), sweet vernal (*Anthoxanthum odoratum*), white clover (*Trifolium repens*) and suckling-clover (*Trifolium dubium*).

For further details regarding the original experiment reference must be made to the article in this *Journal* already cited, where there will also be found an account of what is meant by "relative palatability," together with certain details regarding palatability derived from field observations and a list of indigenous grasses showing what various authorities considered their palatability-value.

FURTHER OBSERVATIONS MADE AT CONICAL HILL.

During the middle of September, 1919, Mr. C. E. Christensen, Acting Tourist Agent at Hanmer Springs, gave permission for certain sheep to be pastured on the Conical Hill Reserve, which had been without stock for about eight months, except for a few rabbits. These sheep, 645 in number, were crossbred hoggets which had been travelling for fourteen days from Coalgate on their way to the Hossack Station, and were consequently extremely hungry when turned on to the pasture of the reserve. There they were allowed to remain for five days—*i.e.*, during that period the pasture carried nominally twenty-six sheep to the acre. But this estimate gives no idea of the true state of affairs. A considerable portion of the reserve is taken up by paths, trees (see Fig. 1), and rocks. To this portion of the reserve, useless for grazing, may be added the bare ground—no small amount—and that occupied by actually unpalatable plants (see Fig. 6) and the dead leaves of the grasses, especially of the tussocks. Nor is this all, for the space taken up by the poa and fescue tussocks must be taken into consideration, since, as will be seen, they are of extremely low palatability. Therefore the actual area of fairly palatable food for the 645 hungry sheep would be very small indeed. Under such circumstances it might well be expected that the five days' grazing would make a strong mark on the pasture, and this was indeed the case in many places (see Figs. 2, 3, and 4); in fact, any plants which remained uneaten under such heavy stocking may confidently be considered either absolutely unpalatable or possessing an extremely low degree of palatability when in company with the particular species which were eaten.

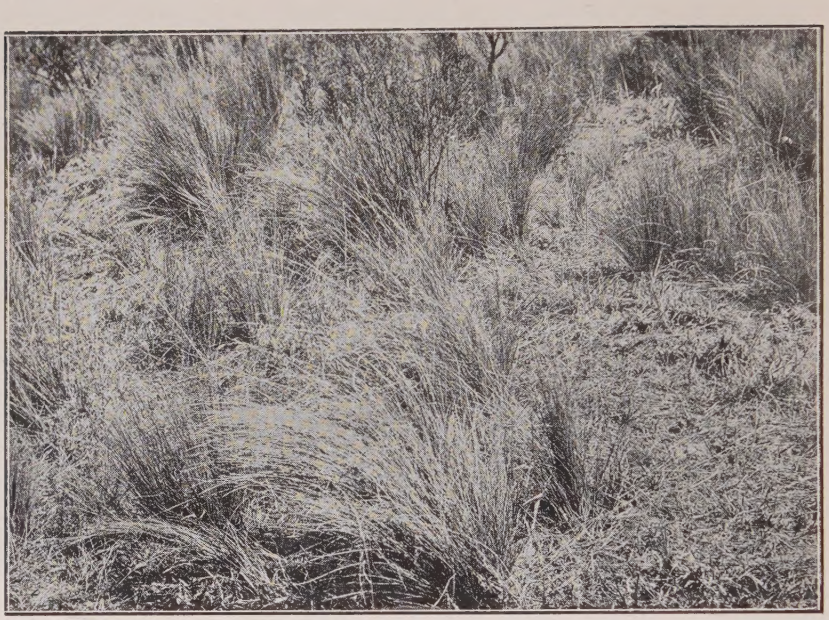

FIG. 3. VIEW OF SMALL PIECE OF LOWER PASTURE OF CONICAL HILL, SHOWING THE CLOSE GRAZING OF THE COCKSFOOT BETWEEN THE TUSSOCKS.

FIG. 4. THE CLOSELY GRAZED MEADOW-GRASS (POA PRATENSIS) ON THE SUMMIT OF THE HILL.

[*Photos, W. D. Reid.*

Conical Hill was visited by me on 20th October, 1919—*i.e.*, about thirty-six days after the sheep had been removed — and several subsequent visits were paid. At that time the pasture bore unmistakable signs of close grazing, certain grasses having been eaten to the ground; and in some places, where after the first experiment a close growth of uneaten grass remained, the grass was cropped as closely as if it had been mown with a scythe (see Fig. 2). On the other hand, where the tussocks originally predominated no difference was to be seen (see Fig. 5) unless examined closely.

Since I had no opportunity of seeing the sheep actually grazing nothing can be said regarding the relative palatability of the species eaten. All the species which had been freely eaten during the first experiment were again closely cropped. This was only to be expected. On this occasion the point of interest lay in those plants, already cited, which had been eaten either very slightly or not at all during the experiment of the preceding February. The degree to which these apparently more or less unpalatable species were eaten must be now considered, taking them in the order already given.

(1.) The poa-tussock (*Poa caespitosa*): In most instances poa-tussock was not eaten at all. This can be plainly seen from Fig. 7, where the untouched tussocks stand closely side by side bordering the path. Occasionally, however, poa-tussock was eaten slightly, but never to anything like the same extent as the far more palatable Yorkshire fog (*Holcus lanatus*) or catsear (*Hypochoeris radicata*) growing alongside. Evidently its palatability is extremely low, for it is greatly exceeded in this regard, as will be seen further on, by a grass of such poor palatability as sweet vernal (*Anthoxanthum odoratum*). On the other hand, there is conclusive evidence that the young leaves which appear after the tossuck has been burned are of fairly high palatability.

(2.) The fescue-tussock (*Festuca novae-zelandiae*): The fescue-tussock appears to stand regarding its palatability almost in the same position as the poa-tussock; but, as the dominant species of the montane tussock-grassland, the question of its palatability is a matter of far greater importance. Figs. 5 and 6 show that the fescue-tussocks as a whole were unaffected by the September overstocking. It was only in a few cases that the tussocks had been nibbled, while plants not extremely palatable, side by side with them, had been freely eaten. As with the poa-tussock, the fescue-tussock affords good feed after burning.

(3.) The blue-tussock (*Poa Colensoi*): The name *Poa Colensoi* is used collectively to include a number of closely related grasses which possess so many characters in common that, up to the present, taxonomic botanists have been content to apply this collective name to the whole group, and have made no attempt to separate it into the true-breeding varieties of which it is composed. Here it is only the plants of the Hanmer neighbourhood, including the tall blue-tussock, which are referred to. These may, of course, have a different palatability-value from one or other of the unnamed varieties making up the species. Judging from the former experiment, as also from many field observations, the blue-tussock seemed to be a grass of very low palatability, so that the question arose, Would it be eaten to any extent during overstocking, and might it be more palatable than either

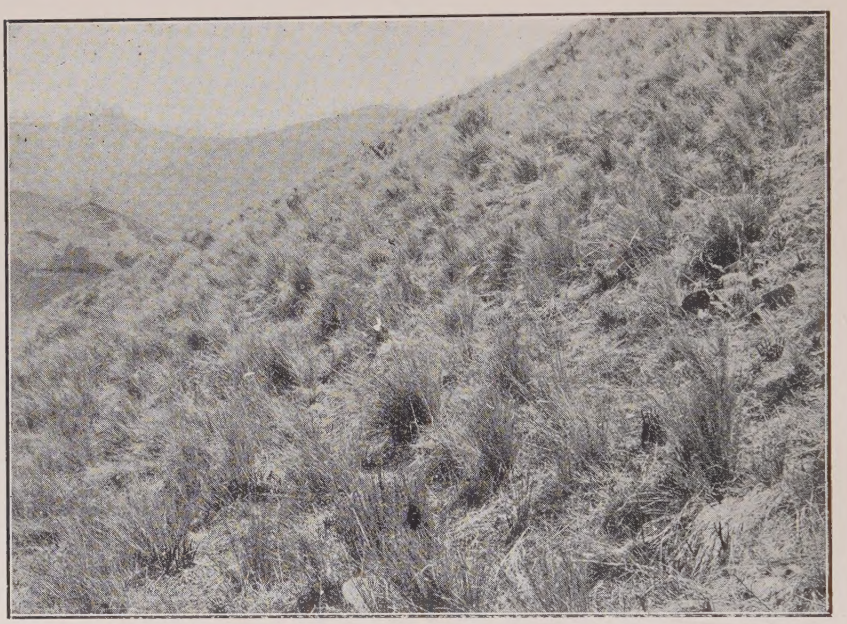

FIG. 5. GENERAL VIEW OF THE SOUTHERN TUSSOCK-CLAD (FESTUCA NOVAE-ZELANDIAE) SLOPE OF CONICAL HILL.

Showing the grazed ground between the tussocks in the foreground and the dense growth further away.

FIG. 6. GROUND ON THE HILL OCCUPIED BY UNPALATABLE PLANTS.

In front, the swamp-lily (*Chrysobactron Hookeri*), showing black in the photograph; and behind, close growth of the fescue-tussock.

[*Photos, W. D. Reid.*

the fescue-tussock or the poa-tussock? Fig. 8 shows distinctly that both these questions can be answered in the affirmative. When growing side by side on Conical Hill with either the fescue-tussock or the poa-tussock the blue-tussock was closely eaten. This happened again and again: it was no chance occurrence. The question now awaiting an answer is, What is the relative palatability of this grass? So far as present observations go it stands considerably lower than Yorkshire fog (*Holcus lanatus*), catsear (*Hypochoeris radicata*), sorrel (*Rumex Acetosella*), and hawksbeard (*Crepis capillaris*), and very much lower than meadow-grass (*Poa pratensis*) and cocksfoot (*Dactylis glomerata*).

(4.) Sweet vernal (*Anthoxanthum odoratum*): The former experiment showed that sweet vernal was also a grass of very low palatability. Fig. 2 clearly shows how greatly it was eaten during the September heavy grazing. From this a higher degree of palatability might be assumed for this grass than appears to be the case. Thus, sweet vernal is extremely abundant in the vicinity of Mount Peel (Canterbury), fields originally laid down in rye-grass having changed to sweet vernal; but during my visit to that locality during the first fortnight of last November the sweet vernal was apparently altogether neglected, fiorin (*Agrostis alba*) and catsear (*Hypochoeris radicata*) being selected in preference. Possibly sweet vernal may be of value during the winter and early spring, but for the rest of the year it can only be classed as a pasture-weed, occupying, as it does so frequently, ground capable of growing cocksfoot (*Dactylis glomerata*).

(5.) White clover (*Trifolium repens*): A surprising feature of the first experiment was the fact that white clover was not eaten at all. Also field observations during the months of January and February, 1919, supported this evidence. It becomes of extreme importance to ascertain accurately what position amongst pasture-plants must be accorded to a plant of generally believed high palatability. My observations, up to the present, have led to no finality. White clover was eaten freely during the September heavy grazing of Conical Hill. Also I have been able to record its being eaten on several occasions under ordinary grazing-conditions in different montane pastures of the South Island. On the other hand, meadow-grass, catsear, and even sorrel still appear to be of higher palatability than white clover.

(6.) Suckling-clover (*Trifolium dubium*): This, as pointed out in my former article regarding palatability, consists on Conical Hill "of insignificant plants." Evidently, then, it was not possible for me to accurately ascertain some weeks after the grazing had taken place to what degree it was eaten.

(7.) Other species which were eaten: The following species, the palatability of which was clearly demonstrated by the first experiment, were again freely eaten: Meadow-grass (*Poa pratensis*—see Fig. 4), cocksfoot (*Dactylis glomerata*), holy-grass (*Hierochloe redolens*), catsear (*Hypochoeris radicata*), hawksbeard (*Crepis capillaris*), Yorkshire fog (*Holcus lanatus*), tufted danthonia (*Danthonia semiannularis* var.), sorrel (*Rumex Acetosella*), broom (*Cytisus scoparius*).

The following, not mentioned for Conical Hill in the former article, were also eaten: Woodrush (*Luzula campestris* var.), *Carex breviculmis*, and red clover (*Trifolium medium*).

FIG. 7. POA-TUSSOCK (POA CAESPITOSA) ON CONICAL HILL REMAINING UNEATEN AFTER THE HEAVY STOCKING.

FIG 8. BLUE-TUSSOCK AND FESCUE-TUSSOCK ON THE HILL.

On left, plant of blue-tussock which shows how strongly it had been eaten, though now with a good deal of young growth. On right, plant of fescue-tussock which had not been eaten at all.

[*Photos, W. D. Reid.*

CONCLUSIONS.

1. The pasture-plants shown in my former article to be of high to medium palatability still keep their position.

2. The fescue-tussock (*Festuca novae-zelandiae*—the dominant species of montane tussock-grassland) and the poa-tussock (*Poa caespitosa*—the common tussock of the lowlands) are of such low palatability as to be virtually worthless except with regard to their young leaves which come after the tussocks are burned.

3. Sweet vernal (*Anthoxanthum odoratum*) is eaten freely in the spring, but in what sequence with regard to other palatable plants was not ascertained.

4. Blue-tussock (*Poa Colensoi*) is far more palatable than was expected from previous observations, and it is altogether a more palatable grass than either fescue-tussock or poa-tussock.

5. It follows from No. 4 that blue-tussock, as it provides food all the winter, might be a good grass to introduce into winter country where it is not already present.

It must be borne in mind that these conclusions are derived from observations made on an area which had been closely grazed during the early spring for five consecutive days by 645 crossbred hoggets.

FRUIT-TREES BLOSSOMING OUT OF SEASON.

THE most frequent cause of fruit-trees blossoming out of season is loss of foliage. This may be caused by the pear and plum leech, or by spraying with mixtures that are too strong, while sometimes plum-rust defoliates trees. In such cases the majority of the fruit-buds that should remain dormant till spring break into blossom. The result is the loss of the next season's crop, and nothing can be done. It is quite a common occurrence for a few precocious buds to break into flower. The cause for this not being easily explained. In such cases it is usually terminal buds that break, and no harm is done, as it does not affect the other parts of the tree. In many places it is quite common to get a second crop of fruit on Bon Chrétien pears, but the second lot being all on terminals no harm results. At the Arataki Horticultural Station, in Hawke's Bay, a Japanese plum known as Large Yellow several times remained evergreen. It produced a great show of blossoms in May and set the fruit, although most was lost from the effects of frost. However, only a portion of the buds broke, and the trees always produced a full crop at the proper season. Briefly put, premature blossoming does no harm when it is confined to twigs. Extensive blossoming will not occur unless the tree suffers a check, such as by loss of foliage, and when this occurs it results in loss of the next season's crop. Loss of foliage can usually be avoided by proper treatment of the pests that cause it. In any case no good will result from pruning before the usual time—namely, during winter while the trees are dormant.—*W. H. Taylor, Horticulturist.*

TESTING OF PUREBRED DAIRY COWS.

MUTUAL PEARL OF ROCK'S LATEST RECORD.

W. M. SINGLETON, Assistant Director of the Dairy Division.

AMONG the Friesians in the Register of Merit we now have three cows with records of 900 lb. of butterfat or over. These are Burkeyje Sylvia Posch, imported from Canada; Westmere Princess Pietertje, bred in New Zealand; and Mutual Pearl of Rock, imported from Wisconsin, U.S.A. Mutual Pearl's latest and best record, recently completed, gives her the third place in the breed in New Zealand as regards butterfat-production.

MUTUAL PEARL OF ROCK.

Mutual Pearl of Rock has been on test four times, and each season she has produced remarkably well, although only two certificates of record have been granted. She failed to calve within the time prescribed after her first two tests. She again calved at the age of 5 years 330 days, and in 365 days was credited with a yield of 736·38 lb. of butterfat from 19,640·1 lb. of milk. Her next freshening was in twenty-four days after finishing this test, and she was again entered. This latest test raised her credit to 903·44 lb. of fat from 25,648·2 lb. of milk. Her four authenticated tests are as follows:—

Age at Start of Test.		Days in Milk.	Milk.	Butterfat.
Years	days.		lb.	lb.
3	187	365	15,677·0	523·58
4	282	365	19,568·8	650·62
5	330	365	19,640·1	736·38
7	11	365	25,648·2	903·44

The sire of Mutual Pearl of Rock is Mutual Piebe de Kol. No other United States bull has been so strongly represented in New Zealand by imported daughters. He is also represented by his son Mutual Piebe of Rock, who has a number of A.R.O. daughters in the United States and C.O.R. daughters in New Zealand. The daughters of Mutual Piebe de Kol that have won certificates of record in New Zealand, together with details of their production, are as follows :—

Name.	Age at Start of Test.	Fat required for Certificate.	Days in Milk.	Milk.	Fat.
	Y. dys.	lb.		lb.	lb.
Mutual Pearl of Rock ..	7 11	350·0	365	25,648·2	903·44
	5 330	350·0	365	19,640·1	736·38
Martha Elgin Pauline II ..	7 2	350·0	365	17,707·4	604·94
Mutual Dulcina Vale.. ..	5 181	350·0	365	16,949·4	589·66
Mutual Maggie of Rock ..	3 295	306·5	289	16,242·1	545·41
Heilo Johanna Lyons ..	2 244	264·9	365	13,599·5	487·24
Mutual Belle of Rock ..	4 217	335·2	324	13,554·2	469·28
	3 185	295·5	342	12,882·1	433·68
Mutual Dulcina Vale.. ..	4 229	336·4	278	13,031·1	429·67
Heilo's Torohunga No. 1 ..	2 334	273·9	365	12,948·7	426·64
	1 304	240·5	365	11,210·2	358·96
Mutual Pontiac of Rock ..	3 130	290·0	323	9,924·1	313·66

Unfortunately, some of the daughters of Mutual Piebe de Kol did not calve sufficiently early after test to qualify for a certificate of record. An indication of these productions, as authenticated by the Dairy Division, is given below, however, in order that the prepotency of Mutual Piebe de Kol may be further substantiated. Uncertificated records of this sire's daughters are the following :—

Name.	Age at Start of Test.	Fat required for Certificate.	Days in Milk.	Milk.	Fat.
	Y. dys.	lb.		lb.	lb.
Mutual Pearl of Rock ..	4 282	341·7	365	19,568·8	650·62
Mutual Ideal of Rock ..	4 229	336·4	365	20,828·2	642·77
Mutual Dulcina Vale.. ..	7 270	350·0	365	17,486·3	550·37
Mutual Pearl of Rock ..	3 187	295·7	365	15,677·0	523·58
Mutual Fannie Vale Piebe ..	3 163	293·3	348	12,666·9	465·31
Martha Elgin Pauline II ..	3 186	295·6	365	12,251·7	432·66
Mutual Fannie Vale Piebe ..	4 272	340·7	313	11,679·1	425·60

It will have been seen that Mutual Pearl of Rock "came back" with her yield season after season. Another good example of this trait in the daughters of Mutual Piebe de Kol is that of Dominion Mutual Mercedes of Rock, imported by the New Zealand Department of Agriculture. For her first four seasons, under ordinary good herd conditions and with twice-a-day milking, her credits were,—

Age at Start of Test.	Fat required for Certificate.	Days in Milk.	Milk.	Fat.
Years days.	lb.		lb.	lb.
2 10 ..	241·5	362	11,604·30	373·06
3 6 ..	277·6	336	12,047·25	414·33
3 348 ..	311·8	356	12,628·75	427·19
5 27 ..	350·0	332	14,649·00	529·76

Mutual Pearl of Rock was imported and tested by Mr. W. Barton, of Featherston. With the exception of two animals all the daughters of Mutual Piebe de Kol referred to above were owned and tested by Mr. Barton. We consider that the importation of this strain in such large numbers has been of direct benefit to New Zealand purebred Friesians and to New Zealand dairy stock in general. The influence of this family will be continued, as representatives are to be found in the sires now being used in a number of Friesian herds, including among others those of P. McNaughton, Morrinsville; Dickie and Clegg, Wainuiomata; the Boys' Training-farm, Levin; J. C. N. Grigg, Longbeach; and the Central Development Farm, Weraroa.

MILK AND CREAM FOR FACTORY SUPPLY.

THE PRODUCTION OF SOUND RAW MATERIAL.

(Continued.)

G. M. VALENTINE, Dairy Instructor, Auckland.

THE MILKING-MACHINE.

THEORETICALLY, machine-drawn milk should be purer than that drawn by hand, but it is a matter of common experience that where there is an increase in the number of machines in use in a district the quality of the milk-supply shows deterioration. The fact that some machine-users can supply milk and cream of high quality shows that this deterioration is either the result of neglect or of ignorance on the part of the others as to the proper means to adopt to keep the machines thoroughly clean. A good deal of this ignorance is the direct result of competition among salesmen who, in their anxiety to make sales, minimize the amount of care necessary to keep the machine thoroughly clean. The invention and general adoption of the releaser system has increased the cleaning difficulty, and it is doubtful whether there has been any actual gain to the dairy industry as a result of its use. Practically the only saving has been in the actual work of milking. In the case of a small herd this is balanced by the extra labour entailed in washing the releaser after milking is finished, if the work is done thoroughly. There is little doubt that the releaser has resulted in a general drop in the quality of milk and cream, which has resulted in expensive pasteurizing plants being required at the factories to deal with defects in the raw material.

The proper erection of the milking plant in the first instance will minimize the labour entailed in cleaning, and attention is directed to the following points: All piping, whether for the conveyance of milk or attached to the air-system, should be erected in lengths not exceeding 6 ft., and should be provided with unions so that they can be taken down for cleaning. Drawn-brass piping is compulsory for milk-pipes, and it is to be preferred for air-pipes, as it is much more

easily kept clean. Several makers are now erecting their machines in this manner.

Regarding the air-pipes: have as few angles as possible, and if they cannot be avoided put in crosses and plugs instead of elbows or bends, as it is then an easy matter to get a brush into the pipes. A tap for flushing the air-system should be provided at the end farthest from the vacuum-pump. Should milk get into these pipes at any time through a split inflation, or through the air-tube being connected to the milk-pipe on the claw by mistake, it can be at once flushed out with cold water followed by boiling water and soda.

The vacuum-tank should be erected outside in the open air where there is a concrete floor under it, so that it can be washed out and emptied with the least trouble. It should be placed so that it can be reached from the floor without climbing up a ladder, and the lid should be big enough to allow of every part of the tank being seen and reached with a brush without difficulty.

The overhead milk-pipe should be erected with a drop of about 1 in. in 60 from the far end of the machine to the releaser, and must be perfectly straight so that the milk and wash-water will not lie in the pipe. For this reason and others already given do not have the releaser-inlet higher than the level of the overhead pipe. Have the releaser erected so that one can easily see into it and reach every part with a brush. If the shed is too low the roof should be raised.

At least two tubs are necessary for the proper handling of milking-machines, one in which to wash them and the other for holding the parts between milkings.

WATER-HEATING APPLIANCES.

For heating water for washing purposes there is nothing better than an ordinary washing-copper, because it actually boils the water. No other heating arrangement brings the water up to boiling-point (212° F.) and holds it there. The whole of the separator parts can be dipped right into it, and come out thoroughly scalded and in a few moments are dry. The same can be done with the releaser, and for scalding out the milking-machine it provides the hottest water that can be got, while once a week the milk-tubes can be put into it and boiled.

Where steam is available it should be arranged so that the pipes can be connected direct on to the milk and air pipes of the machine, as it is difficult to get water which is heated in a tub above 190° by blowing steam into it.

Water heated by any of the various arrangements attached to the engine-exhaust, copper, or cooling-tank is quite useless for scalding dairy utensils. In fact, these contrivances are responsible for quite a large proportion of the faulty milk and cream received at our factories. Having purchased one, the dairyman considers himself equipped with everything necessary for heating water to keep his machine clean. The water is quite hot enough for ordinary washing up, but by the time that is finished the supply has run out, and consequently the machine never gets thoroughly scalded. The result is a yellow deposit on the inside of the milk tubes and pipes, and a complaint of milking-machine flavour in the milk or cream. Cases can be quoted where a change from exhaust-heated water to boiling water for scalding the machine after

it had been thoroughly washed has got rid of this flavour in a supplier's cream, the grade rising from second grade to 92 points or over. Oil-engine heaters are also liable to give trouble on account of the danger from leaks, and an oily flavour in cream has frequently been traced to this cause.

MILKING-SHED CONDITIONS AND PRACTICE.

The erection of an up-to-date milking-shed provided with every convenience does not necessarily ensure a high quality of milk or cream. It will certainly make it much easier to produce a good quality, but unless the shed and appointments are kept thoroughly clean no improvement will result. Many sheds are allowed to get into such a state that the milk produced is not so good as that produced under the most primitive conditions.

The atmosphere surrounding a dirty milking-shed is laden with germs which find in milk a congenial breeding-ground, providing the food and temperature best suited to their development. From the growth of these germs in the milk come the "unclean" flavours, even though the utensils may be above reproach. The importance of this matter of bad smells is not grasped by many dairymen. Recently a case of unclean flavour in cream was found to be due to the supplier's habit of throwing the wash-water a few feet from the door of the dairy. Unclean flavour has also been traced to the practice of standing the can of cream beside an opening in the wall through which the drainage escaped, the draught coming in through this opening after passing over the dirty drain being the cause. As the bad flavour disappeared after the cream was shifted to another position, conclusive evidence was afforded.

In a machine-milking shed an unclean atmosphere is an even greater danger. The air in a milking-machine is only as pure as the source from which it is drawn. Every milking-machine has on some part of the teat-cup or claw an air-inlet to ease the suction on the teat. This air, together with the milk drawn from the udder, is carried along through the milk-pipe to the releaser, with the result that the smell of the shed is absorbed by the milk. The surging of this air and milk can be seen through the sight-glasses usually inserted in the milk-tubes, and the aeration of the milk observed.

Again, in order to maintain the partial vacuum of 15 in. at which most milking-machines work, a safety-valve is provided on some part of the air-system. Through this valve a certain quantity of air is drawn at each stroke of the pump. Obviously if this air is foul the whole system must be the same. Further, in a shed the floor of which is unwashed, manure in the form of fine dust raised by the movements of the cows is drawn directly into the milk.

Milk from a newly calved cow should not be used until the fifth day after calving at the earliest, but in many cases a good deal longer should be allowed to elapse. It depends entirely on the state of the milk. Milk from a cow that has not properly cleansed should never be used, as it would cause a flavour resembling putrid meat. Cowy flavour is usually the result of overheating cows by racing them with dogs. This will also tend to reduce the test, as a nervous cow will not secrete so much fat in the milk when highly excited.

Generally speaking, a better quality of milk is received from a hand-milking shed than from machines. Where this is not so it is usually the result of the neglect of the simplest rules of cleanliness. Common-sense will tell the average milker that an udder which has been dragged through the mud requires washing and drying before starting to milk. In dry weather and in clean surroundings a rub with a dry cloth may be quite sufficient, but the habit of washing the teats before each milking is a good one to get into. Cleanliness in this washing is quite as necessary, however, as in any other part of the dairy-work. To rinse the teats with water from a dirty bucket, using a sour odorous rag which is never washed, is worse than useless; yet this is the practice in many sheds where they would never dream of starting milking without going through the form of washing the udders. These buckets and cloths must receive their share of attention.

The number of sheds in which proper conveniences are provided for the milkers to wash their hands is comparatively small, and in some cases such washing is never done. This neglect and the practice of wearing the dirtiest clothes in the shed are two of the most common sources of milk-infection, and also one of the causes of the spread of disease in the herd. To the average clean person it is second nature to be as careful over milking as in the handling of any other food, but the shed where these points are neglected is easily picked out by the dirty state of the leg-ropes, bail-pins, gate-fastenings, &c.

It is a good practice in machine milking to draw some cold water through the milk-pipes before starting. This will damp the pipes, which will be much easier to wash afterwards.

MILK STRAINING AND STRAINERS.

Unless the strainer is kept clean it is better not to use one at all. A good strainer will take out the sediment in the milk, but will not remove the germs and fluid which do most harm. The obvious thing to do, then, is to keep the dirt as much as possible from getting into the milk. Too often the strainer is a cause of infection, as a result of the state in which it is kept. A clean cloth makes a good strainer, but it must be washed and scalded every day. If this is not done it will soon become coated with a deposit of yellow stale milk, and will do more harm than good.

It is impossible to wash a wire strainer thoroughly with a cloth. A deposit of stale milk will usually be found just where the gauze and the tin are soldered, and quite often the same deposit shows in the corners. The circular strainer usually sold in country stores, having a piece of gauze in the centre and a rim soldered on to the bottom, is a survival of the pan-skimming days. At the junction of the rim with the body there is a crevice which is very hard to clean, and is frequently found to be full of sour, stale milk. Dairymen are advised to get the better class of strainers now made by dairy tinsmiths. No holding-frame is required for the larger sizes, as they hook on to the side of the vat or can with clips. The corners and seams are well floated over with solder, and are easily kept clean. (See Figs. 1 and 2.)

An improved circular pattern of strainer, suitable for use with the ordinary round separator milk-tank, is made in one piece of drawn tinned steel without seam. The straining-medium consists of one

FIG. 1. AN IMPROVED TYPE OF MILK-STRAINER.

The milk is twice strained, with no clogging of the gauze. The sediment falls to the bottom of the strainer—not on the gauze, to be washed through.

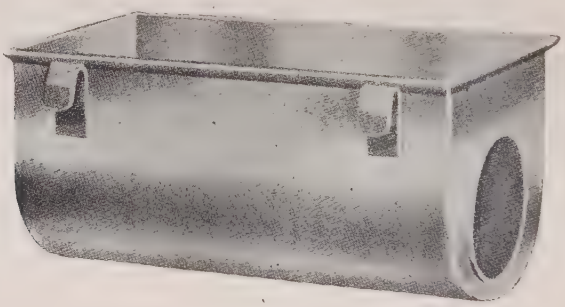

FIG. 2. ANOTHER GOOD TYPE OF STRAINER.

Note clips for hanging on side of milk-receiver (also in Fig. 1).

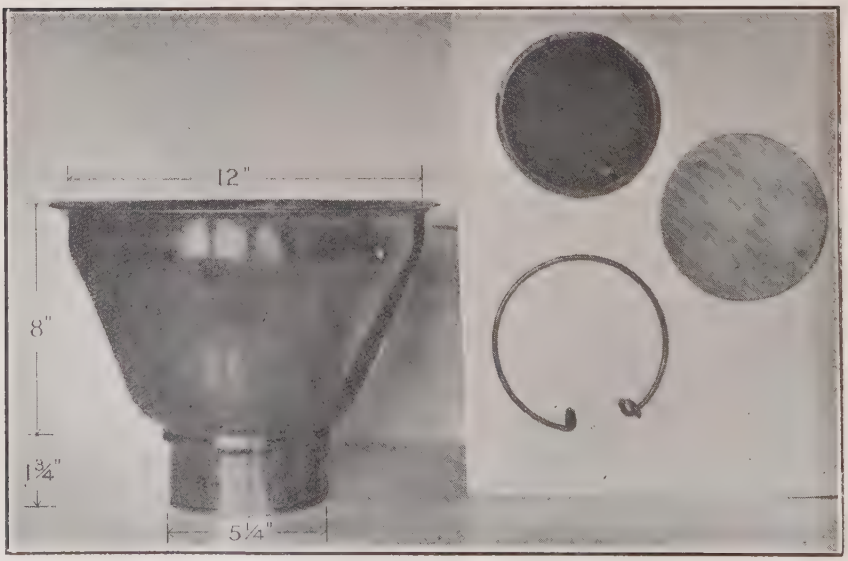

FIG. 3. CIRCULAR PATTERN OF STRAINER, WITH REMOVABLE DISKS.

piece of perforated tin and one piece of fine gauze (the latter on top), held in position by a spring clip. As the disks are removable they are easily kept clean. New disks can be put in at any time, thus doing away with the difficulty of getting them soldered. (See Fig. 3.)

COOLING MILK.

The care of milk for direct delivery to a factory is a simple matter, provided ordinary cleanliness has been observed in its production. The milk should be cooled immediately it is drawn by passing it over a cooler of sufficient size to reduce the temperature to within a few degrees of that of the water available. The size of cooler required will depend on the volume of milk and the temperature of the cooling-water. If cool water direct from a well is available a small cooler will do better work than a larger one when comparatively warm creek-water has to be used. Water which has been pumped in the morning and has stood in the sun all day is practically useless.

Under average conditions a cooler 12 in. wide by 28 in. deep will be sufficient to cool the milk from forty cows. In the case of machine milking an 18 in. by 28 in. cooler will probably be necessary. When buying a cooler it is always best to get one on the big side, as a large cooler will do better work than a small one if the supply of water is limited or if the water is not very cold. Even if the supply of water should fail, milk will be improved by running it over a cooler, provided the surrounding atmosphere is pure. Spread the night's milk over the whole of the cans in use, by means of a tray having a hole for each can, but do not mix morning's and night's milk together.

Stir frequently with a metal plunger (Fig. 4), but do not use a wooden stirrer. On a farm where no steam is available it is almost impossible to keep a wooden stirrer clean and sweet.

FIG. 4. METAL PLUNGER FOR STIRRING MILK OR CREAM.

Do not think that the morning's milk does not require cooling because it is not held long on the farm. Cooling is not recommended solely for the reason that it keeps the milk from going sour, but also as a means of getting rid of animal odours and feed flavours. It is thus most beneficial when done immediately the milk is drawn.

The delivery of first-quality milk at the factory is a business proposition for the supplier. The condition of the milk has a direct influence on the test, as proper care in cooling and stirring will prevent the cream from rising. A better quality and a higher yield of both butter and cheese can also be made from milk which has been properly cared for.

TREATMENT OF CANS.

Cans when received back from the factory require to be washed and scalded. Even if thoroughly washed and scalded at the factory

(which is seldom) it is necessary to repeat the operation after the cans have been closed up for some hours.

Metallic flavour in both milk and cream is caused by rusty cans. This is due to the action of the acid on the steel of which the cans are made. This action is very rapid in milk-cans in which whey is brought home from the factory. Where cream is held for two days on the farm before delivery this flavour becomes very pronounced. Enamelled buckets, though excellent for holding cream while new, are easily chipped, and once the iron is exposed do not last very long. Well-tinned milking-buckets are quite as good, and in most hands last a good deal longer.

Suppliers having rusty cans should return them to the makers and have them retinned. The cost will depend on the condition of the can and the distance from the works. A minimum freight can be secured by sending them through the factory, which can arrange for a number to be sent together. Ten-gallon cream-cans in a very bad state have been done at a cost of 16s. each (not including freight), and as the dents were taken out at the same time, floats repaired, and labels resoldered, they were practically made over again. Compared with the cost of the same can when new (about 60s.) it is money well spent. Cases can be quoted where a defect in cream disappeared entirely after the cans were retinned.

THE CARE OF CREAM.

The keeping-quality of cream depends to a great extent upon the handling of the separator. Cream which has an even, smooth texture, and contains from 40 to 45 per cent. of fat, is the best for all purposes, though a 50-per-cent. cream is even better from the keeping point of view. As, however, the conditions have to be exceptionally good for most separators to do clean skimming when delivering a 50-per-cent. cream, it is not advisable to skim so thick.

Most of the flavours complained of in cream develop in the curd which it contains, consequently the likelihood of such flavours is less in cream containing a low percentage of curd. Many suppliers argue that it does not pay to send in rich cream, as the return from the factory is not so good for such quality. This was correct in the days when a pipette was used to measure the samples into the test-bottles, for 9 cubic centimeters of rich cream weighed less than 9 cubic centimeters of thin cream. But this is not the case with present-day testing, as all samples are weighed. Any supplier wishing to satisfy himself on this point can do so by altering his separator from day to day to skim cream of varying thickness, and having the skim-milk tested after each alteration. If there is no great loss of fat in the skim-milk when skimming rich cream it follows that the factory will show an equal return, as the fat originally contained in the milk must be in either the cream or the skim-milk.

For many other reasons thin cream is inferior to rich cream to the supplier and the buttermaker, and is a cause of loss to both. The feeding-value of skim-milk for use on the farm is anything from 1d. upward per gallon, so that in sending it away to the factory in his cream the supplier is robbing himself.

If the cream is thin and sour, testing, say, 25 per cent. of fat, it is a very difficult matter to get a correct sample. The error may be either way, but is more likely to be against the supplier, consequently it is unsatisfactory to both parties. This thin cream will also give trouble by blocking up the strainers; it is very liable to give a scorched flavour to the butter through burning in the pasteurizer, is more expensive to handle on account of its bulk, and the loss of fat in the buttermilk is greater.

COOLING AND SHELTER.

The importance of efficient cooling as it leaves the separator is second only to cleanliness in the production of high-grade cream. As in the case of milk, the reason for cooling cream is not solely to keep it from going sour. Practically all cream which is delivered every other day is sour when received at the factory, but the percentage of acidity will vary according to the treatment it has received both before and after skimming. Acid, however, is one of the minor defects found in cream, providing it is clean-flavoured. Putrefactive germs, which may find their way into cream even in the cleanest dairy, will be checked by efficient cooling, and strong animal-odours will be removed; but cooling will not prevent the growth of germs which result from dirty milking-machines, separators, &c. Those are germs which only the pasteurizer will kill, and the flavours which they produce very frequently remain after pasteurizing. Further, cooling will not do any good if the surrounding atmosphere is impure.

As a means of getting rid of feed-flavour cooling is not sufficiently appreciated, and it is difficult to convey anything like the importance of this matter to any one who has not had a practical demonstration of the difference between cooled and uncooled cream. Such feed-flavours as result from cows eating the strong growth of pasturage in the spring—trefoil, Lotus major, clovers, sweet vernal, lucerne, &c.—can be almost entirely eliminated by cooling, or, at least, so minimized as to be hardly noticeable. Therefore the excuse that these are the predominant grasses on the farm can hardly be accepted. Flavours such as those of garlic, pennyroyal, and other weeds of a similar nature will certainly be reduced, but cannot be got rid of altogether. This is also true regarding the flavour caused by the cows drinking swampy impure water or eating weeds growing in land of that nature.

To be effective the cooling must be done as the cream leaves the separator, and to get the best results the cream must be exposed to the action of the water and air by being spread over the cooler in a thin film. The thinner the layer of cream and the colder the water the better will the results be. Difficulty in getting the cream to spread over the whole surface of the cooler is usually the result of bad washing. If the cooler is greasy, through not having been thoroughly scalded, the cream will trickle over the cooling-surface in small streams instead of spreading.

For a separator up to 50 gallons per hour the flat horizontal cooler measuring 30 in. by 3½ in. by 1½ in., and made by the various dairy-supply firms at a cost of about £1, is suitable. This cooler (Fig. 5) can be very easily arranged to hang under the cream-spout at the receiving end and rest on the cream-can at the open or delivery end,

with a fall of not more than ½ in. to the cream-can. The cream will then pass very slowly over the cooling-surface. Attach the hose at the lower end of the cooler, so that the water is running from the lower to the higher end—that is, in the opposite direction to the cream. By this means the water-jacket is kept full and the cold water is meeting the cold cream, while the partially warmed water is meeting the hot cream. This is the principle upon which the efficiency of all coolers depends.

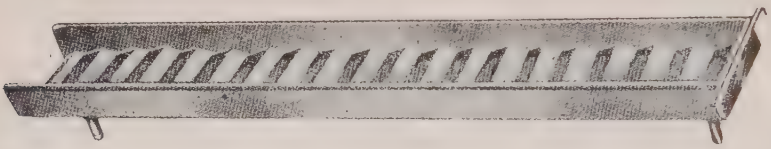

FIG. 5. HORIZONTAL TYPE OF COOLER FOR HAND SEPARATOR.

For large separators a small circular cooler (Fig. 6) measuring about 7½ in. wide by 12 in. high will be required. A small stand is necessary for this style of cooler, and this can be easily made by fitting a piece of pipe into the concrete floor. Cut a piece of board large enough to take the cooler, and nail a piece of 3 in. by 2 in. across it. Bore a hole in the 3 in. by 2 in. and screw it on to the top of the pipe. A hole through the board for the overflow hose will complete a cheap and easily washed stand. Put the hose on the bottom and outside connection on this cooler also.

If no water is laid on to the separator-room an oil-drum with a tap soldered into it can be used. Place the drum on a bracket at a

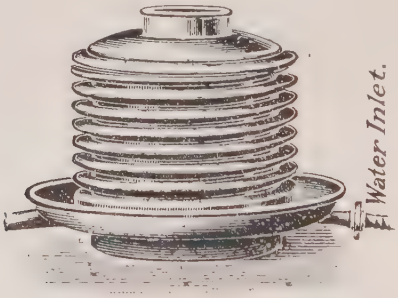

FIG. 6. SMALL CIRCULAR COOLER FOR LARGE SEPARATOR.

point where the bottom of the drum is a little higher than the highest part of the cooler, and connect the hose from the tap to the water-inlet in the cooler. One of the taps usually sold for filling kerosene-lamps, with cutter for perforating the tin and rubber washer to make the joint, if screwed into a benzine-tin, makes a cheap water-can. It requires a short length of pipe soldered into the outlet to connect the hose. The fact that a large supply of water is not available is no excuse for not cooling cream. More water is required for washing up than will be necessary to cool the cream, and as the same water can be used for washing up it makes no difference to the amount used.

If comparatively warm tank or creek water is the best that can be got it can be cooled very considerably between milkings by placing some in a can in the draught caused by the ventilation, which latter should be provided in all separator-rooms. If a wet sack is wrapped round the can the water will cool even better, especially in hot districts where cream-cooling is most necessary.

The same results are not attained by placing the can of cream in cold water as by passing it over a cooler. The bulk is too great to allow the heat and odours to escape, even if thoroughly stirred, which is not often done. Place the cream in cold water after it has been cooled, and stir frequently with a 6 in. metal plunger. A wooden stirrer is, if anything, worse for cream than for milk, as owing to the greasy nature of the cream it is harder to keep clean.

A very efficient shelter for cream may be built as follows: Construct a square frame with sufficient floor-space and height to hold all the cans in use, allowing enough head-room to get at the cans for stirring. Make the floor of open battens about 2 ft. from the ground. Have a tin dish made about 6 in. deep to fit into the top of the frame. No roof is required. Tack strong scrim round three sides of the frame, having the top edge long enough to hang over into the dish; tack another piece of scrim along the top on the fourth side of the frame; sew or tack a round stick on to the bottom edge of the scrim, so that the front covering can be rolled up and form a door. Fill the dish with water, and damp the scrim all round the top edge to give the water a start, and it will siphon down the sides and keep the air in the shelter cool in the hottest weather. The temperature of the water placed in the dish does not matter. Cream treated in this way has been delivered to the factory practically sweet at two days old. The more exposed the position in which the stand is placed the better will be the result.

Even in the best-conducted dairy it is advisable to remove the cream to a stand, but if no water is used as described it should be built in some shady spot—say, under a tree. Small quantities can be hung up in a tree if a clean piece of buttercloth is tied over the can, as there is usually a cool draught in such a place.

Where cream has to be left on the roadside to be picked up by a wagon some means of protecting it from the sun should be provided. In some cases it is brought out early in the afternoon of the day before it is picked up, and stands for some hours in the hot sun. Cream treated in this way will develop an oily, metallic flavour.

Lids should never be put tight on cream-cans until about to send them away, as they will prevent the escape of any gas which develops. Stir each skimming immediately after separating, in order to break down the froth, and as often afterwards as possible.

MIXING.

Even when thoroughly cooled, it is not advisable to mix the cream until it is being sent away to the factory, or, at least, until the next milking. Where the cream is not cooled it is disastrous to mix, as the mixing of the hot and cold cream will keep the temperature up to the point at which the germs multiply rapidly, and thus develop all

the worst flavours. This is one of the causes of "Maori bug" flavour in cream—one of the worst to deal with.

It is a good plan to have a bucket or can for each skimming, and keep them separate until just before sending away. Do not use benzine-tins for carrying away milk or to hold cream in. It is possible to make a good bucket out of a benzine-tin if the bottom seam and the top edge are floated over with solder, but unless this is done (and it seldom is) it is impossible to get the sour milk out of these two places.

Dirty tins and barrels in the separator-room to catch the skim-milk are a frequent source of infection. The atmosphere of the whole room is polluted with the smell, which is absorbed by the cream. This flavour is common on most factory platforms, and can be easily distinguished, as it resembles nothing so much as the sour, yeasty smell of the barrel from which it originates. If left long enough this class of cream will develop fermentation.

VENTILATION OF SEPARATOR-ROOM.

The necessity for a pure atmosphere in the separator-room cannot be too strongly urged. It can only be maintained by scrupulous cleanliness and proper arrangements for ventilation. On opening the door one is frequently met by a combination of odours in which sour milk, separator-oil, dampness, &c., are all present. This may not be noticed by the owner, as he is used to it. The cause may be splashes of milk on the walls, benches on which cream has been spilt, or a separator-block saturated with oil. Cream kept in such an atmosphere cannot but be poor. The remedy is boiling water and limewash. Rooms which have been formerly used for pan-skimming dairies should have a good coat of limewash to get rid of the stale smell which frequently pervades them. Rooms in old buildings usually give a flavour of decayed wood to the cream.

Ventilation should be provided in the separator-room by making an opening on a level with the floor on one side of the room, and near the top of the wall on the opposite side. On a hot day the heat of the sun on the roof will cause a circulation of air through these openings, and the draught at the bottom will dry the floor and keep the place sweet, providing everything in the room is perfectly clean.

In many cases where the separator-room is built with vertical boards without battens the owner argues that there is plenty of ventilation—too much, in fact, in cold wintry weather. The time when ventilation is most necessary is in warm sultry weather when the air is heavy, and to create this air-circulation a proper arrangement of ventilators is necessary.

A coat of limewash once a year will greatly help to keep the separator-room fresh and sweet. This can be put on with a spray-pump, which is a much quicker method of doing it than by hand.

It is a mistake to build a separator-room too big. The unoccupied space is a temptation, and results in all manner of miscellaneous articles being stored in it to the detriment of the cream. The practice of placing the separator in one end of the milking-shed is, happily, not common, and should not be allowed under any circumstances.

(To be continued.)

THE GEOLOGY OF LIMESTONE.

Extract from "THE LIMESTONE AND PHOSPHATE RESOURCES OF NEW ZEALAND": Geological Survey Bulletin No. 22, by P. G. MORGAN, Director, assisted by officers of the Survey.

LIMESTONE is a rock that during some bygone period of the earth's history was, as a rule, formed in beds or layers under a sheet of water, in most cases salt, but in some fresh. With the exceptions to this general statement the reader need not at present trouble himself. As originally formed most deposits of limestone extend over large and perhaps immense areas, but all, of course, must have had limits. Subsequent happenings have in nearly all cases reduced those limits, and not infrequently the reduction, especially for practical purposes, has been enormous.

In order that the reader may clearly understand what the original limits of a bed of limestone were he must ascertain the conditions accompanying the formation of the deposit—that is, its mode of origin; and if he would know what the present limits are he must not only explore the outcrops, but must study the changes that have taken place since the deposit was formed—that is, he must dip rather deeply into the science of geology.

By proper field studies it will be found that some calcareous deposits —for example, those of concretionary origin, those formed by precipitation from springs (travertine), and those formed in fresh-water lakes—have comparatively small extent. Again, many limestone beds vary enormously in thickness and in quality from place to place. Often an originally large deposit, owing to the action of wind and weather, running water, ice, &c., becomes reduced to a small body. Especially is this the case when the limestone has been raised to an elevated position by forces working within the earth's crust, so that the eroding and dissolving agents mentioned above have free scope for action.

One of the most important facts in connection with carbonate of lime is that under certain conditions it is soluble in water, whilst under other conditions water containing carbonate of lime in solution deposits it as a solid substance (stalactite, stalagmite, travertine, &c.). Water is capable not only of dissolving many solids, but also of dissolving or absorbing appreciable quantities of all gases. Cold water in contact with carbon dioxide can dissolve its own bulk or more of the gas, and then becomes what may be called carbonated water. The solution is really a weak acid (the true carbonic acid), and, as such, slowly dissolves carbonate of lime and various other substances. If boiled it parts with its carbon dioxide, and the same thing happens to a considerable extent when the carbonated water is exposed to air. It is not the function of this bulletin to explain the physical laws regulating the solution of gases by liquids, and therefore the solution of carbon dioxide by water, but it is as well to say that scientifically exact statements cannot easily be made without diving into the science of physics. What has to be said here is that rain-water contains a little carbon dioxide derived from the atmosphere, and by means of this contained carbon dioxide it

becomes capable of acting much more energetically upon limestone than perfectly pure water (which, it should be remembered, does dissolve limestone to a small extent). In its passage through the soil rain-water may absorb more carbon dioxide, produced by decaying vegetation, and thus become still more capable of dissolving carbonate of lime and many other minerals. Such comparatively highly carbonated water may percolate through limestone, slowly dissolving the rock in its journey. In the course of time great passages and caverns are thus formed in the limestone. Later the conditions are changed somewhat, and water dripping through the roofs of the caverns deposits part of its dissolved carbonate of lime in the form of stalactites pendent from the roofs, and the greater part of the remainder on the floors in the form of stalagmite. In this manner are formed the beautiful limestone caves found in many parts of the world. The explanation of stalactites and stalagmites generally given is twofold. In the first place, the lime-charged water holds more carbon dioxide in solution than it can normally take up from air. Coming into contact with air it gives up the excess of carbon dioxide, and then is compelled to deposit a corresponding amount of carbonate of lime hitherto held in solution as the double carbonate $CaCO_3.H_2CO_3$, otherwise represented as $CaH_2C_2O_6$. Secondly, some of the water evaporates, and with it some of the carbon dioxide goes. This causes precipitation of part of the dissolved carbonate of lime. It is possible that in some cases bacteria play a part in the formation of stalactites and stalagmites.

Large as may be the amount of carbonate of lime dissolved by carbonated water from limestone, a still larger amount is dissolved by percolating water from other classes of rock. Ultimately the greater part of this dissolved lime is carried by rivers to the sea, which is, indeed, the great storehouse from which nearly all limestone deposits are derived. From sea-water countless organisms, of which the most familiar are shell-fish and corals, abstract carbonate of lime in order to form their hard parts.* When these organisms die, their calcareous remains may be partly redissolved by the sea-water, but for the most part they collect on sea-beaches and on the sea-bottom, forming calcium-carbonate deposits of varying degrees of purity, which in time consolidate to hard limestone. As time goes on the calcareous deposits may be covered by beds of sand, mud, or other material. Then may come far-reaching geological changes: great earth-movements take place, the bed of the ocean is upheaved and becomes dry land. The originally horizontal or nearly horizontal strata may remain horizontal, but in many cases are tilted, broken by faults, and bent or crumpled into folds. In places the land may be so greatly elevated as to form mountain-ranges, on the top of which may be found rocks containing shells and other fossils, indicating that the strata once formed part of the ocean-bed. Unless the climatic conditions are altogether inhospitable vegetation quickly appears, forming a green protective coat on the newly born land. Running water and other erosive agents at once get to work, doing their best to destroy the work of the elevatory forces, and in course of time carve deep valleys. The limestone beds, which at first were probably hidden by overlying deposits, are exposed and dissected by the streams, which

* This statement has been disputed. Some authorities consider that dissolved calcium sulphate is the source of the lime used by sea-animals in building their solid parts. See A. Geikie's "Text-book of Geology," 4th ed., Vol. 1, 1903, p. 613

if small will follow underground channels in the limestone, but if large will soon cut valleys through it. An important practical point is the manner in which surface water and small streams disappear underground in limestone country owing to the formation of sinkholes and subterranean watercourses.

Emphasis must be given to the facts that all important limestone deposits have been formed in the sea as horizontal sheet-like layers of great lateral extent, and that subsequently they have been elevated, and in many cases contorted and broken. Denuding agencies have exposed beds of limestone originally hidden under other deposits, in places over wide areas, in places to a small extent only. In many districts the whole or the greater part of a limestone deposit has been removed by denudation.

ORIGIN OF LIMESTONE.

Most limestone is of organic origin—that is, derived from the remains of calcareous animals or plants; some, however, is of chemical origin—that is, precipitated from solution; and some may be regarded as mechanically formed—that is, it is derived from the waste of a pre-existing calcareous deposit. Considered with respect to their origin or mode of formation, limestone deposits may therefore be divided into three classes, which will be described in the order of increasing importance.

I. *Mechanically formed Limestone.*—No limestone can be correctly termed a mechanically formed rock except with regard to its mode of accumulation. Thus limestone debris may collect at the foot of a cliff; shell-banks may be formed on a beach by the action of the waves; finely broken shells, corals, &c., may be blown inland by the wind and form calcareous sandhills and ridges. Some of the so-called soft-limestone deposits of New Zealand belong to this class. They seem to be weathered accumulations of limestone debris.

II. *Chemically formed Limestone.*—Carbonate of lime may possibly be precipitated from solution in shallow parts of the sea, owing to the heating or partial evaporation of the sea-water. Such deposits, however, if they occur, are of little importance. Even in the cases where arms of the sea have been totally cut off from it, and evaporated to dryness, no great bed of limestone can result. It is thought, however, that some large deposits of chalky limestone are partly of chemical origin. The theory is that in the deeper parts of a sea cut off from the general oceanic circulation chemical changes (assisted by bacteria) would cause the precipitation of carbonate of lime from sea-water.

The deposits of travertine, calcareous tufa, or calcareous sinter formed by precipitation of carbonate of lime from the water of some springs and a few rivers have already been mentioned. Calcareous sinter must be distinguished from the siliceous sinter deposited by most hot springs, a material which is valueless for agricultural purposes. There is reason to believe that much travertine has been formed through the action of fresh-water algæ, and thus is of organic and not chemical formation.

Oolitic limestone, or oolite—that is, limestone formed of small spherical grains of carbonate of lime with a concentric structure—is generally classed as of chemical origin, but it is now known that minute

algæ play an important part in abstracting the carbonate of lime from sea-water, and therefore oolitic limestone is more correctly considered to be of organic origin. Pisolitic limestone, composed of large grains approaching peas in size, is otherwise similar to oolite.

At Kotuku, near Greymouth, several bores drilled in search of oil discharge in geyser-like fashion salt water highly charged with carbon dioxide and dissolved carbonate of lime. The greater part of the carbon dioxide at once escapes, and abundant carbonate of lime is in consequence deposited wherever the water touches any solid object. As the water flows away it forms numerous little balls of carbonate of lime, in size and appearance resembling marbles. Here, at least, we have chemically formed "pisolite."

Under the head of chemically formed limestone are to be included stalactite, stalagmite, and calcareous concretions of all kinds. Veins of calcite such as are common in the rocks of many districts—for example, the Waihi goldfield—may be classed here.

Marble, or limestone that has been more or less recrystallized and otherwise altered, is sometimes classed as a chemically formed rock For most purposes it is better to go farther back in its history and consider the mode of formation of the original limestone.

III. *Organically formed Limestone.*—This, the most important class of limestone, includes all limestones formed by the action of plants or animals. The chief of these are: Ordinary limestone, formed by the accumulation of calcareous material secreted by living organisms of many kinds; coral limestone, in which the main part of the material is composed of the hard parts of corals; polyzoan limestone, similar to coral limestone, but composed mainly of the remains of Polyzoa (Bryozoa); chalk, composed mainly of the remains of the minute organisms known as Foraminifera; alga limestone, formed mainly of the remains of calcareous algæ; and lake-marl, formed in lakes by the accumulation of the remains of fresh-water algæ, shells, and other organisms.

The following part analysis* of a calcareous seaweed or alga (*Iania novæ-zelandiæ*) is of interest, and is therefore quoted here: Water nd organic matter, 31·8 per cent. (containing nitrogen 0·35 per cent.); calcium carbonate, 50 per cent.; potash and phosphoric acid, traces.

Altered and Metamorphic Limestones.

Very often, owing to solution and re-precipitation of carbonate of lime by percolating water, the appearance of a limestone is so changed that its original character may be a matter of doubt. Such altered limestones usually exhibit what is known as a crystalline structure. Many limestones, especially those in the older rock formations, have been converted into the highly crystalline form known as marble by the combined action of water, heat, and pressure.

Some limestones, especially those that originally were somewhat impure, are found to contain great numbers of siliceous concretions. The flint nodules of chalk deposits are of this character. Again, a limestone, by the infiltration of water containing silica in solution, may be almost wholly changed to chert, a flinty form of silica or quartz.

* Aston, B. C.: 10th Ann. Rep. Dept. Agric., Chemistry Division, 1902, p. 119.

In this case most of the carbonate of lime has been removed in solution, and silica brought by the dissolving waters has taken its place.

When igneous rocks such as granite or diorite are intruded into limestone great changes may take place near the intrusive rock. The carbon dioxide of the limestone is largely expelled; and highly heated siliceous waters escaping from or associated with the igneous rock convert the lime into various silicate minerals, the chief of which are garnet, wollastonite, vesuvianite, diopside, and epidote.

Mode of Occurrence of Limestone.

The mode of occurrence of limestone has been more or less indicated on the preceding pages. In recapitulation it may be said that limestone occurs typically in widespread beds or sheets of variable thickness, enclosed in other sedimentary strata. Subsequently to their formation these strata have been upheaved, tilted, folded, broken, and subjected to denudation. Hence the limestone, once a continuous horizontal sheet, may be found in all kinds of positions, even in that of verticality. In some places large amounts of limestone may be exposed; in others either the amount of limestone is actually small, or the greater part is deeply buried beneath superincumbent strata. In such a case, if the structure and thickness of the enclosing strata are observed, it is possible to ascertain the depth of the limestone stratum at any given point. The mode of occurrence of non-stratified deposits of limestone, such as stalagmite, stalactite, travertine, slope debris (talus), calcite veins, &c., is sufficiently explained by their mode of formation.

Geological Systems and the Geological Time-scale.

The study of the sedimentary strata covering the earth's surface shows that in the aggregate they are of great thickness, and that their deposition has occupied a long period of time, probably quite 100,000,000 years.* The non-geological reader may perhaps need to be reminded that once none of the rocks he sees around him were in existence. This applies to the igneous rocks now exposed on the earth's surface as well as to the sedimentary rocks; but this bulletin is concerned only with the latter, except in the case of the so-called marble of Milford Sound, and possibly one or two other localities in western Otago, where masses of carbonate have been formed by some unexplained process in connection with igneous rocks.

The older sedimentary rocks are, of course, overlain by the younger, except where great earth-movements causing compression of the strata or complicated faulting have caused overturning, an occurrence that is only local, and is usually easily detected. Although, owing to elevation above sea-level alternating with depression, and owing to erosion during periods when the land emerged from the sea, the succession of strata is in no locality complete, nor can a complete record be obtained even by piecing together the data obtained in different localities, yet

* Estimates of the period in question vary from a few million years to 700,000,000 years or more. The lower estimates cannot possibly be accepted, the higher are more than doubtful. The earth itself, however, was formed long before the oldest known sedimentary rocks. From a geological point of view it would be reasonable to suppose its total age to be roughly 200,000,000 years. [This estimate is very conservative, and would be doubled or even trebled by many present-day geologists.—P. G. M., April, 1920.]

geologists, largely through the aid of fossils, have obtained a good, though imperfect, understanding of the past history of the earth. The sedimentary rocks have been placed according to age in several great divisions, known as the Palæozoic (at one time called Primary), Mesozoic (Secondary), and Cainozoic (or Tertiary) eras. The rocks formed during and since the time known as the glacial epoch, a time when ice invaded the lowlands of much of Europe and of the northern part of North America, are placed in the Quaternary era or age. The rocks of each era are classified, according to principles explained in works on geology, into systems each corresponding to a period of time, and these are subdivided into series, formations, and stages, the last-named subdivision representing what are called epochs of time.* The breaks in deposition caused by recurring elevation of the sea-bottom, or rather of portions of it, above sea-level are considered by all stratigraphical geologists of prime importance in delimiting the geological systems.† During times of depression the loss of material caused by erosion during elevation was made good by the deposition of new strata. A little reflection will show that these matters are of importance to the inhabitants of the earth. To take an illustration that directly concerns the subject of this bulletin: during periods of depression limestone deposits were formed, whilst elevation brought them within reach of man and has also led to their part loss through erosion.

It is known that the geological history of all parts of the earth's surface has not been the same. Local elevation and depression on a small scale has often happened without other parts of the earth, so far as known, being affected. On the other hand, it is believed that the major movements have been world-wide, and have produced results that can be traced on all parts of the earth's surface by one means or another. Hence geological systems established by study on one part of the earth's surface are thought to be applicable to other parts; but in many cases it is impracticable to trace the subdivisions of the systems made in Europe through the rocks of another continent or far-distant islands like those of New Zealand. Indeed, were it not for fossils, little could be done in correlating the rocks of one country with those of another, and almost the whole science of stratigraphical geology would be undone. Parenthetically it may be said that fossils are of tremendous importance not only to the science of geology, but also to that of evolutionary biology.

On account of the difficulty of correlation, local names are frequently used for geological formations and even systems, and the proposal has been made that in New Zealand the attempt to use the European time scale should be practically abandoned. Though the use of a local set of system-names as an alternative to the European names is convenient and commendable, the European time-scale ought never to be lost sight of. Opinion, however, is bound to differ as to what amount of prominence should be given to it.‡

* Some authors use "age" as the time-term corresponding to "stage." Geological usage of these and similar terms is by no means uniform. See Arch. Geikie "A Text-book of Geology," Vol. 2, p. 859, 4th ed., 1903.

† This statement will not be fully endorsed by all geologists, but the exceptions will be found mainly among those who pay great attention to theoretical considerations, or who have not had much to do with stratigraphical geology.

‡ A good statement of the case, but summing up against the European time scale, will be found in P. Marshall's "Geology of New Zealand," 1912, pp. 173–74

The following table illustrates the various geological systems represented in New Zealand :—

Era or Age.	System or Period. (European Time-scale.)	Corresponding New Zealand System.
Quaternary ..	Recent	Recent.
	Pleistocene ..	Pleistocene.
Cainozoic or Tertiary	Pliocene	Wanganui.
	Miocene, Oligocene ..	Oamaru.
	Eocene	Mawheranui or Waimangaroa.
Mesozoic	Cretaceous ..	Waipara.
	Jurassic, Triassic ..	Trias-Jura (Hokonui system of Park).
Palæozoic ..	Permian, Carboniferous ..	Maitai.
	Devonian ..	Te Anau (?).
	Silurian	Baton River. Part of Aorere (?).
	Ordovician ..	Aorere.
	Cambrian ..	Part of Aorere (?). Maniototo series of Park(?).
Archæan (= pre-Palæozoic)	Various divisions ..	Manapouri(?).

By consulting the classifications given by Park* and Marshall† the reader will ascertain that unfortunately there are still great divergences of opinion among New Zealand geologists concerning the classification of the sedimentary strata.

A table of geological systems like that given above is a time-scale as well as a rock-classification. The periods represented are, however, of very unequal lengths. Though in general geologists avoid stating ages in years, for the excellent reason that they are unable definitely to fix the length of any given geological period, yet estimates based on assumptions of one kind or another have been made. Various authorities consider that the Palæozoic periods were from 40,000,000 or 50,000,000 to 100,000,000 years or more ago, and the Mesozoic periods from, say, 8,000,000 to perhaps 40,000,000 years ago ; whilst the Tertiary periods reach back less than 7,000,000 years. The Eocene may have begun 5,000,000 or 6,000,000 years ago, the Miocene 3,000 000 years ago or less. Pleistocene time is comprised within the last 200,000 years, and Recent time within the last 30,000 or 40,000 years.

At one time physicists wished to restrict the age of the earth, as reckoned from the beginning of life on its surface, to 25,000,000 or 30,000,000 years. The chief reason given was that the sun could not have poured out heat for a longer period. The discovery of radium has changed all that ; and now some physicists, as the result of studies

* Park, James : "The Geology of New Zealand," 1910, p. 25.
† Marshall, Patrick : "Geology of New Zealand," 1912, p. 173.

on the radio-activity of rocks, assign most extravagant ages to them, such as 1,000,000,000 years and more. Some biologists and palæontologists, on evolutionary grounds, demand at least 400,000,000 years for the development of life on the earth to its present stage, but most geologists are satisfied with the 100,000,000 years mentioned above.

In New Zealand probably more limestone is of Miocene age than any other, but Pliocene, Cretaceous, and Ordovician limestones are also abundant.

ORCHARD SANITATION.

W. H. RICE, Orchard Instructor, Hastings.

SANITATION as applied to the orchard covers a wide range of factors important for the thorough well-being and vigorous health of trees. A consideration of a few of these points provides much food for reflection, and a careful system of sanitation well carried out will repay the orchardist not only by assisting him to control pests, but by furnishing primary means of preventing the spread of infectious diseases. "Infectious" is a term not generally used in connection with fruit-tree diseases, yet it is a term to keep well in mind throughout the control scheme applied to such diseases, conveying as it does just that note of warning we have been taught to respect in its true light regarding diseases of mankind.

SUNLIGHT AND AIR.

Sunlight and air are important points of all sanitation, and therefore merit serious consideration in connection with the orchard. One has only to examine trees adjacent to and shaded by shelter or other trees to see the spindly undeveloped growth produced where sunlight and air are partially withheld from the tree. This kind of wood is unable to give the necessary support to a payable crop of fruit, is readily susceptible to attacks from pests and diseases, and the trees are generally in a declining condition. It is better to allow a wider headland than create a slum part of the orchard. Compare this class of growth to the robust condition attained by trees that are in direct sunlight, and one is forced to the conclusion that light is essential throughout the orchard and throughout the framework of each tree. So the prudent orchardist endeavours to train his trees in a manner calculated to allow free access of light to all parts of the tree. Examination of a dense-growing tree of a lateral fruiting habit, subject to woolly aphis, further emphasizes the necessity of an open tree from the point of disease-control. Sunlight also has a distinct immediate commercial value, as the high-coloured fruits have a greater market value than poorly coloured specimens of the same variety.

A free circulation of air is required by trees for proper development. Shelter is a very important factor in fruitgrowing, but can be carried to excess and create a stagnant-air condition which is far from desirable. The best shelter no doubt is that planted a reasonable distance back from the orchard-line, but with closer settlement each occupier has to plant shelter on his own property to ensure permanency. This shelter-

belt should be of a nature which will not deflect the air-current altogether, otherwise the orchard, or at any rate the part adjacent to the belt, will become an air-pocket—calm, no doubt, when gales blow, but very oppressive at ordinary times. Such a condition has a devitalizing effect on the trees in this area. The ideal shelter should be open enough to permit a free circulation of air, yet break the force of wind. The opposite to overshelter is the forced draughts created by blank spaces in the belt, and sometimes by an entrance gate placed in the wrong position—such a draught will check considerably any trees under its influence.

ENVIRONMENT.

One of the essential points to ensure maximum development of plant-life is proper environment. Aquatic, alpine, bog, and various other species each requires its own particular environment in order to attain perfection. So also with fruit-trees is environment an important factor. One hears much about pedigree trees, and variation as regards precocity, regularity of cropping, &c., but no actual evidence has been brought forward to substantiate the claims of pedigree trees, and it remains to be proved whether bud-selection will perpetuate these desirable qualities. The exception is mutations or true sports, which vary only in colour from the parent. Experiments have failed to show that trees grown from one source will maintain the same character. On the contrary, the same relative amount of individual degeneracy or superiority is found, thus emphasizing the power of environment. Bud-selection is no doubt desirable, but protection from adverse conditions is absolutely necessary.

The rooting-area is worthy of more consideration than it usually receives—"out of sight out of mind" is not a fair way to treat this area. A deep, well-drained, sweet soil provides the required conditions for root-development; subsoiling or working to a great depth is not all that is necessary to make the soil deep. Depth suitable for root-action depends a good deal on the water-level of the land. Drainage is necessary for lowering this water-level in most soils. Many orchardists have had the disadvantages of soil-saturation brought to their notice by the loss of trees from sour-sap caused by the decay of root-fibre. Where free drainage is not available this happens to a certain extent each season, and much valuable root-formation dies out. Fertilizers are often used on land well stocked with plant-food, under the impression that the trees require feeding, when really the drainage is at fault.

Being assured of a deep soil, cultivation is necessary to ensure soil-sweetness or thorough aeration, as the life of beneficial bacteria in the soil is largely dependent on proper aeration. A fine division of soil-particles is more easily maintained with soils well supplied with humus. The modern usage of artificial fertilizers, which do not add humus to the soil, makes it advisable that some cover-crop should be grown and ploughed in to supply decayed vegetable matter, without which soils in time become unproductive for want of humus. The ground should be cultivated from the spring onward, often enough to maintain an earth mulch or open division of soil-particles a few inches deep. At the time of the last cultivation—with the early autumn rains—seed of a cover-crop may be sown to be ploughed in either in early winter or spring.

Spring ploughing has a much greater effect on the trees than is generally supposed. The early activity of the trees is supported by plant-food stored in the trees through the winter. Such activity is ahead of the root-action, and unless a further supply is early available from the roots the trees will receive a check, often severe enough to cause the newly set fruit to fall. Early ploughing will permit the soil to attain a much higher temperature than unploughed soil, with a consequent earlier root-action.

Good drainage, cultivation of the soil, with cover-crops turned in often to maintain humus, are, then, very necessary to ensure a sweet sanitary condition of the rooting-area.

CLEANLINESS.

We have impressed upon us by necessity the doctrine of cleanliness as applied to the control of humus and animal disease. The nature of many fruit-tree diseases is such that the orchardist should exert himself to the utmost and apply many of the principles of domestic hygiene to orchard practice. A moment's thought will suggest many avenues through which improvement in this respect could be attained. The indifferent manner prunings are dealt with no doubt helps to perpetuate some of the diseases affecting fruit-trees. When pruning, the rule to cut out all dead wood is or should be applied, and close investigation usually shows that this wood has been killed by disease. Diseased wood is also rigorously cut out at pruning-time.

This should cause every grower to ask himself whether he is dealing with his prunings in the most sanitary manner. Such prunings are often bundled in a heap, dragged through the orchard, and tipped into a hollow or left on the headland till some other day. Disease usually attacks the weaker subjects in an orchard, and what better or more ready means of dissemination could be devised than this unsanitary practice of dragging about prunings? The heap of prunings left lying about is a much greater menace than seems generally recognized. Many diseases are surely difficult and costly enough to control in the parasitic stages on fruit-trees without thus providing a natural harbour where they may become saprophitic and rest until favourable conditions again permit them to attack the trees, often creating an epidemic. Weather favourable to fungoid diseases is usually unfavourable for spraying operations, so that a little cleanliness in time may be of more value than many gallons of spray under epidemic conditions. The best method to adopt in disposing of prunings is to destroy them by fire as soon as possible after being severed from the tree. This should be done without dragging the prunings about the orchard. A portable furnace can be used and moved about as required. A serviceable destructor to meet the requirements of the average orchard can be constructed from an old iron tank and a cart-wheel tire. Halve the circle of the tire, and open to form a rocker sledge by bracing with iron to support the tank. The latter is perforated at the bottom and lower parts of the sides to ensure a draught, and allow the ashes to be spread on the land as the furnace is moved. These ashes are of manurial value.

The thorough cleanliness essential to wound-healing can be applied to orchard practice. It often becomes necessary to remove large limbs, yet how often this is done with the same saw used to remove dead

and diseased wood, without any precautions being taken to prevent infection. Then, more often than not the wound is left with the rough edges untrimmed, so retarding the formation of callus—nature's covering for tree-wounds. A little care, such as trimming the bark-edge smooth with a sharp knife and covering the wood surface of the wound first with a disinfectant, will materially assist nature by preventing decay. An examination of numerous cuts suggests that very few over 3 in. in diameter ever heal right over, unless cut parallel with the part retained. The same pruning-tools are sometimes used on diseased and clean trees alike throughout the orchard. This is a common cause of rapid spread of such diseases as canker, and would be obviated by using a special pair of secateurs for the removal of diseased wood, or the sterilization of pruning-tools with corrosive sublimate of a strength of 1–1000.

Old cases, lids, tins, sacks, props, &c., are often left lying about in the orchard. This is not only untidy, it is unsanitary, as diseases and pests thrive in such haunts. Even a casual examination will often disclose several codlin-moth pupæ or mealy bugs safe in the home carelessly provided by the orchardist. Municipalities have lately adopted a clean-up week to improve the city sanitary conditions. This could also be applied with advantage to many orchards. One of the earliest methods of moth-control was to hunt them in the winter under loose bark, &c., and provide a summer-bandage harbour, which could be readily examined. More up-to-date control measures have rendered this bandage unnecessary, therefore the provision of any other harbour which is not so readily examined should be avoided. The orchard packing-shed should also receive attention, old cases being examined and treated, and bench cover-boards removed and examined. Many moth-cocoons may generally be found in the crevices of the sack packing-table so commonly used. It is surprising the number that can be located and destroyed in a short time, and when one considers the multiplication at infection-time the risk of wormy fruit has been considerably reduced by the destruction of even a few grubs in hiding during the winter. It is not uncommon to find cases of diseased fruit left lying about in the packing-shed—fruit which has decayed from a variety of rots and moulds, which are being propagated in countless numbers under such conditions and constitute a serious menace to future crops. All decayed fruit should be destroyed, and the shed cleaned up with the same care one would bestow on a dwelling.

IMMUNITY OR RESISTANCE TO DISEASE.

Disease-immunity is possessed by man, animals, and plants. Artificial inoculation, or recovery from a previous attack of disease, confers immunity in certain cases on man or animals, but the writer knows of no parallel in plant-life. Race immunity, however, applies to all alike. As special races of animal-life are immune to certain diseases, so racial varieties of fruit-trees are resistant to various diseases which do great damage to others of the same natural order. It is on this phase of resistance that we rely for predisposition or otherwise of trees to diseases, and although the road is a stiff grade for the plant-breeders they have given us many valuable varieties immune to special diseases. There remains yet another form of immunity—or, rather, partial

immunity—that assured by the maintenance of physical fitness, or, as applied to plant-life, vigour. Any methods which assist trees to attain and maintain a vigorous healthy state should be carried out. They will repay the orchardist financially, and ensure that pride of ownership which welcomes inspection.

PIG-RAISING NOTES.

K. W. GORRINGE, Instructor in Swine Husbandry.

No branch of live-stock farming gives better results than the raising of well-bred pigs when conducted with a reasonable amount of intelligence. The pig is one of the most important animals to raise on the farm, and no farm is complete unless some pigs are kept to aid in the modern method of farming. The pig requires less labour, less equipment, less capital, and makes greater gains per weight of concentrates supplied than any other farm-animal. It reproduces itself faster and in greater numbers, and returns the money invested more quickly. In some districts, owing to the dried-milk industry, most farmers have gone right out of pig-keeping, not having any product from the dairy to feed with. This should not have happened had the farmer been acquainted with the highly profitable method of grazing pigs on various crops. Instruction is now being given on this subject by the Department, and in view of the great shortage in pigs farmers should give the crop method their serious consideration.

PASTURES AND PASTURING.

The best way to manage pig-pastures is to have them divided off into two or more enclosures. These may then be alternated or rotated by removing the pigs from one paddock when the pasture gets short, and turning them into another when the forage is abundant and fresh. With lucerne this is especially desirable, because, by rotating, a certain amount of hay may be cut from the different enclosures in addition to the grazing. This system causes the lucerne to yield a maximum amount, betters the quality of the forage, and at the same time is good for the stand, in that occasional clipping seems to freshen and invigorate the growth, and too close and continuous grazing is injurious.

It has often been asked how many pigs can be grazed on one acre of various crops for a given time. In the following compilation may be found some useful averages, the pigs being reckoned as 100 lb. animals:—

Crop.	Number per Acre.	Number of Days.	Crop.	Number per Acre.	Number of Days.
Lucerne ..	13	132	Poa pratensis ..	13	118
Red clover ..	12	107	Wheat ..	14	90
Sweet clover ..	15	87	Rye	15	90
Rape ..	18	76	Sorghum ..	16	77

The season, the luxuriance of the growth, the size and development of the animals, and the amount of supplementary feed given have,

of course, important bearing on the number of head of pigs an acre of pasture will carry, but, as indicated, the figures represent average condition with the crops mentioned.

The results from the use of pasture crops seem to be practically all advantageous. The good results are plenty of much-needed exercise, with healthier and faster-growing pigs, less work, a saving of grain, and cheaper gains in weight—hence greater profit. Good bone and muscle are grown, the bowels are kept open, and the general condition of the pig is maintained at a high standard. Furthermore, the droppings of the animal enrich the land. In spite of any injury that may be done to the crop, and the expense of fencing, the best opinion is that pasture crops are necessary for profitable pork and bacon production.

RAPE FOR PIGS.

It seems to be not generally known that pasturing pigs on rape is a profitable operation, especially when supplemented by a 1- to 2-per-cent. ration of maize, barley, or other concentrates. Next to lucerne rape affords the most nourishing, succulent, and palatable crop on which to graze pigs. This fodder, so far, has not received the attention it merits from pig-breeders, but it will certainly become more popular as its merits for such feeding become better known.

Rape is considered one of our best catch-crops, and pigs turned in to graze the crop manure the soil. Rape is a better green feed for growing pigs than good clover pasture, pigs fed upon rape having made on the average 100 lb. of gain on one-third less grain than was required by the pigs fed on clover pasture. The pigs are more thrifty, have better appetites, and make greater gains when supplied with a rape pasture in conjunction with their grain feed than when fed on grain alone. Rape, in fact, may be claimed to be the most satisfactory and cheapest green food for pigs. Every feeder should plant each spring a small field of it adjoining his pig-yards, and provide himself with a chain or two of movable fence, in order to properly feed the rape to brood-sows and young pigs. Rape should not be pastured until the plants are at least 12 in. to 14 in. high. Pigs should not be allowed to root while in the rape feed.

It must be noted that in no instance is it advisable to depend on rape alone as a fodder for fattening pigs. Young pigs do well on this class of fodder up to the stage when they have to be fattened. It distends the digestive tract and renders it better able to digest a food richer in carbohydrates, such as maize, barley, pollard, skim-milk, or other foods, which may be given with rape to fatten. It is also well to remember that when stock are first turned in to graze on rape it is very laxative and liable to cause scouring. This means that until the animals become accustomed to the new diet they should be given only a few hours daily on the crop.

PREVENTION OF DISEASE.

Rotation of pastures is a valuable aid in the prevention of disease among pigs. A paddock that has been used continuously for many years becomes loaded with germs and the eggs of parasites, and a pig born into such surroundings has to fight for his life from the day of his birth. Pig-raisers should therefore arrange for a series of paddocks,

so that the pigs can be shifted occasionally. Plough up the old pig-run and grow some forage crop to which the pigs may be returned later in the season. This not only gives a double use of the ground, but cleanses it of germs and parasties. The practice likewise promotes the vigour of the animals by providing natural wholesome food and exercise in the sunshine, thus increasing their power of resistance to disease.

Sanitation is both a preventive and a control measure. It should be the object of the owner first to prevent disease by providing the proper surroundings. Animals that are forced to live in dark, damp, uncomfortable quarters, wading through filth, rooting their food out of the muck, and drinking polluted water cannot thrive as well as those kept under sanitary conditions. Houses and yards should be located in a well-drained place, which can be kept reasonably clean; also an adequate supply of pure water is essential. Germs retain their disease-producing power for long periods in damp, dark houses; therefore the pig-sty should be flooded with sunshine and properly ventilated. Sunshine is nature's great disinfectant. It is one of the things of which New Zealand has an abundant supply, and no pig-breeder should be guilty of harbouring disease in his herd because he has excluded from the pig-houses (whether permanent or portable) this great cleansing force.

The houses should be thoroughly cleaned of all manure and litter, and sprayed with a reliable disinfectant. The wash should be made thin enough to be applied with an ordinary spray-pump. Limewash is in itself a fair disinfectant, and, being sprayed, has the advantage of being driven into cracks and crevices not easily reached by a brush; moreover, it is easily seen, and serves to indicate the thoroughness of the work. Lime should be sprinkled about the pens. Much good work may be done but the object of it all defeated by neglecting an old runway under a building where sick pigs have been lying.

Exercise is highly important, and is one of the chief means of keeping the sow and her litter healthy. A roomy lot or yard is all right, but when the pigs are old enough—say, at two or three weeks—the sooner they are allowed pasture and range the better. They have a tendency to stay in the nest for warmth. Anything that will make them exercise—placing feed and water at a distance, scattering feed, or even scaring them into scampering out of the nest—will be found of value. Little pigs, however, should not be exposed to cold winds or cold rains. In the summer-time when lucerne and other pasture is available the position is easier, for the pigs will range for themselves and get the needed exercise.

The writer's object is to point out the principles underlying health and disease, and to outline the methods which the pig-raiser may employ in combating the common troubles. He should consider whether he is giving his pigs a fair chance for their lives. The pig is not a dirty animal; it will keep clean if the owner gives it the opportunity, and will amply repay all efforts to keep it in health.

Ensilage.—At the Stratford Model Dairy Farm, in February, 96 tons of specially grown crops were put into an ensilage stack.

LAYING OUT THE FARM HOMESTEAD.

THE HORTICULTURAL ASPECT.

W. H. TAYLOR, Horticulturist.

It may be mentioned in the first place that the recommendations which follow are intended to apply specially to the homesteads of smaller farmers, such as do not employ a gardener or handy man to attend to the garden, &c., but perform the work themselves or with the assistance of their family.

In securing satisfactory results and a pleasing appearance for the homestead a great deal depends on initial arrangements. If these are good the way is made plain for future improvements, which usually must come by degrees. Roads that pass close to a house should be avoided, and also arrangements of stables, sheds, &c., that will lead to a horse and dray traffic close to the back door, resulting in a perpetual state of mud and untidiness. On a farm of no greater extent than 50 acres an acre or two can well be spared for the homestead and its surroundings. Provision should be made for a small orchard—say, half an acre—a vegetable and small-fruit garden, a drying-green for the washing, a small backyard with outbuildings, and a garden in front of the house at least, preferably extending to the sides also.

In determining the plan for laying out the grounds convenience should be the first consideration. If convenience is taken as a guide there will never be any difficulty with the design. The access road should be kept a few yards distant from the house, so as to leave room for a belt of low-growing trees and shrubs. There should also be another entrance to approach the back of the house. Only one fence is required, which should be on the farm side of the entrance road. The farmyard with its necessary buildings should preferably be on the farm side of the enclosing fence, or at least well away from the back yard of the house. The road should be well graded, raised in the centre, and have water-tables to carry off rainfall. A low-growing hedge that could be easily kept should bound the road on the house side. Inside this shrubs and trees might be planted as a screen. Care should be taken not to plant trees that grow to a great height; they would overhang and darken the place and make it sombre-looking, besides becoming unsightly.

Where road-metal is easily obtainable some of the natural soil should be removed from the road and the space filled with metal; it is impossible to make a good road otherwise. Paths around the house are a necessity, but they should be strictly limited to serve a useful purpose. They involve labour in keeping them in order, and if neglected they become an eyesore. The paths should be made a few inches lower than the surface of the plots through which they pass, and should serve to some extent as drains for the garden. If a foot in depth of the soil can be removed and its place filled with good metal, blinded with gravel, a dry path will result that can be kept clean with a minimum of labour.

THE FRONT GARDEN.

The best form of garden to lay out in front of a house is one mainly composed of grass. Mixed flower-gardens are liable to be neglected at times and to look untidy, and when a garden has once been neglected and weeds allowed to seed it can rarely be brought into good order again. A lawn does not look very untidy even when not well kept all the time, and it is tidy again as soon as the grass is cut—in fact, the grass is improved if allowed to get long occasionally, as the roots are strengthened. A few flowering shrubs or trees of a suitable habit planted on the grass improve the appearance, and if it is well kept there is no objection to a narrow border for mixed flowers, though on the whole it may be best to omit the border. The trees planted should be of moderate growth. A large tree is quite out of place on a small lawn. Among others, such trees as the various Retinosporas, *Cupressus elegans*, *Cupressus Lawsoniana erecta viridis*, *Cedrus deodara*, *Photinia glabra*, weeping-elm, weeping-lime, weeping-ash, also the upright lime, which give shade in summer and can be kept cut if needed, are suitable for the purpose. All are trees that can be allowed to grow naturally, or if any trimming is required it would be such as would not disfigure the tree. There are also a number of flowering-shrubs that could be planted. There is always a temptation to make beds for flowers, but this should never be done unless it is intended to fill the bed with only one kind of plant. A mixture of plants in a small bed always leads to untidiness, and should be avoided. Flower-gardening of a mixed character can better be carried out on borders running along the side of a house. These borders should be devoted to flowering-shrubs, roses, and any other flowers desired. A comparatively narrow path could be bordered with violets, primroses, pinks, thrift, arabis, aubretias, or any similar plants, thus making full use of space.

By an arrangement of this kind the types of gardening are kept distinct, and the portion in front of the house is always in a presentable condition. The whole plan provides for cleanly surroundings and the avoidance of horse and dray traffic or wandering cattle around the house with its necessary accompaniment of mud.

THE ORCHARD AND VEGETABLE-GARDEN.

Every farm should have a small orchard to supply home wants, also a properly laid-out vegetable-garden. Shelter by trees is sometimes an absolute necessity, and it is always advisable. The amount of shelter necessary will, of course, vary in accordance with local conditions and be ruled somewhat by the desires of the owner. An effective shelter for small areas is provided by a single or double line of Lombardy poplars. These trees take up very little ground-space, and are easily topped to prevent them getting too high. The thinnings may not have much value as wood, but will, if burned, produce a valuable amount of potash, which will benefit the trees and garden crops. If Elæagnus be planted among the poplars it will make a very dense belt by climbing the trees, and in such a position will require very little trimming.

The orchard land should be well prepared by deep ploughing. Subsoiling is usually necessary to provide a deep-rooting medium.

Drainage should also be attended to if required. There is no reason why the orchard land should be unproductive in the years before the fruit-trees come into profit. It would be better not to plant fruit-trees at all unless some plan was made which would ensure them being properly cared for, and where the small farmer is concerned the plan must be one that will ensure adequate return for the labour expended. The space between the fruit-trees may be sown down with red clover or lucerne and a considerable quantity of the crop used as forage. It pays to apply fertilizers, both to benefit the forage crop and to save depreciation of the soil. Such crops also save cultivation, except a small area round each tree, and prevent the growth of noxious weeds. Another plan is to grow potatoes, which should be a good crop if the soil is properly prepared for the fruit-trees. Still another system is to utilize the orchard ground for general vegetable crops, in which case it would be wise to lay down the area that will eventually be the vegetable-garden in lucerne or clovers for forage purposes. When eventually this area is required for vegetable-culture by reason of the fruit-trees in the orchard having come to profit, the lucerne or clover will have greatly enriched the soil and improved its working-condition, and incidentally have been profitable the whole time.

SMALL FRUITS.

A good supply of small fruits should be regarded as a necessity for the homestead. If well-selected varieties be planted after suitable preparations have been made such a garden is bound to be a source of both profit and pleasure. The area planted should be such as there is reasonable prospect of maintaining in good order, otherwise it may prove an annoyance and loss. The amount of produce depends on a good selection of varieties and efficient cultural methods rather than on the numbers planted. The soil should be deeply worked in the first place, and all weeds of a perennial nature worked out before anything is planted. Usually it will be best to put the land under potatoes for a season. The thorough tillage required for this crop cleans the soil and brings it into good working-order, and should give a return covering all the cost of preparation and possibly going a long way towards the purchase of plants.

A word of warning may be necessary here. With small fruits poor varieties give no satisfaction, while badly trained bushes are a nuisance and a waste of labour. Getting cuttings from a neighbour's garden may lead to complete failure, so also may buying the cheapest plants from a nursery. Some people look for the lowest-priced plants; such plants are a delusion and a snare. Purchase only the very best and you get satisfaction from them.

Farmer's Glory is the best gooseberry to grow, and unless a succession is wanted it would be best to grow no other. The bush is a good grower, of fairly good habit, and produces prolific crops of large berries. To make good bushes the cuttings should be nearly 15 in. long. All the buds except four or five at the top should be carefully cut out. The result is a bush that will not sucker and that will have a clean stem of about 8 in. between the surface of the soil and the branches. Such a bush is easily kept in order, the fruit is easily gathered, and soil-cultivation is easily done. Red-currant bushes should be raised in the same

way and for the same reasons. They give an abundant crop if the right varieties are planted, while some varieties seldom produce more than a few scattered berries. La Versailles, Chenanceau, Cherry, and Fay's Prolific are good varieties.

Black currants are subject to the borer, which destroys branches, and bushes can be maintained only by frequently renewing the branches. This is effected by not removing the buds on the cuttings. This causes the bushes to send up branches from below the surface, creating what is known as a stooling habit. Old branches are removed from time to time, leaving young branches in their place. The stooling habit is not objectionable with this bush, the growth being upright and free from thorns. Care should be taken to avoid planting them where sorrel or couch-grass abound, as their roots could not be got out from a stooling bush. Good varieties are Carter's Black Champion and Kentish Hero.

Raspberries require a fairly deep and moist soil; it is useless to plant them in very dry situations. Success largely depends on allowing them time to become established before letting them bear fruit. Old canes are not suitable for planting; young well-rooted suckers that spring clear of the stool are best. Cut them down to about 6 in. or less. A fair crop can be had the second year, and the third year should see them in full profit. Fillbasket and All Summer are two of the best varieties.

TREATMENT OF UNRIPE HONEY.

SUCCESSFUL EXPERIMENTS IN VACUUM BOILING.

G. V. WESTBROOKE, Apiary Instructor, Auckland.

Among the difficulties that beekeepers have sometimes to contend with is that of dealing with unripe and fermented honey. It occasionally happens that honey when extracted contains an excess of moisture, and this after a few months causes fermentation to set up, thus spoiling the honey as an article of food. While in many cases this could be prevented by seeing that all honey is capped over by the bees before removing it from the hives, and by avoiding extraction or leaving the honey exposed during damp weather, yet it sometimes happens that in spite of care the honey contains too much moisture.

By the use of the hydrometer it is possible, however, to ascertain if the honey is ripe before putting it on the market. After some years of testing it is now generally recognized that honey showing a specific gravity of not less than 1·42 is quite safe to keep for some considerable time. Therefore, as no up-to-date beekeeper should fail to test his honey before forwarding, there should be no excuse for the quantities of honey that arrive at the grading-store in an unripe condition. The greatest difficulty, however, has been to know what to do with such honey when it is found to be below the standard gravity. In the past it has been the custom to sell fermented honey to manu-

facturers for vinegar-making, &c., at from 1d. to 2d. per pound. This matter of fermentation thus meant a considerable loss each year to the beekeepers concerned—probably well over £500 per annum in the aggregate.

With a view to saving the class of honey in question experiments were recently undertaken at Auckland by the writer, which give promise of great possibilities. Small samples of honey that had slightly fermented, and which showed a specific gravity of only 1·405, were first dealt with. These were boiled for about ten minutes in a vacuum flask at a temperature of 130° F. This boiling at a comparatively low temperature resulted in ridding the honey of its surplus moisture, also in eliminating the froth and particles of wax, &c., leaving it very clear. After this treatment the honey showed a specific gravity of 1·425.

These small experiments were so encouraging that arrangements were made to treat a large quantity at the Colonial Sugar Refining Company's works, and in conjunction with the New Zealand Honey Producers' Association about 6 tons of slightly fermented honey was secured from different parts of the Dominion. This honey on being tested registered from 1·4 to 1·405, and analysis showed that the water-content was about 20 per cent. As the honey was more or less granulated it was found necessary at the sugar-works to reliquefy it by adding about 25 per cent. of hot water. This also enabled it to be pumped into a large vacuum-vat. It was then boiled for over half an hour at a temperature of 120°. During the process of boiling several tests were made by the writer, and when a gravity of 1·425 was registered the heat was shut off and the honey run into tins. It finally registered 1·432, which indicated a very ripe honey.

This honey now shows no trace of fermentation, nor are the germs likely to again become active, as there is not sufficient moisture to allow them to do so. The honey prior to treatment had rather a strong, rank flavour and aroma, which has now disappeared, thus considerably improving its quality, although it may be slightly darker in colour.

The success of this experiment should justify the Honey Producers' Association in procuring a vacuum-vat for treating all honey that does not come up to the standard required to avoid fermentation. Such honey should be treated before the ferment germs start in it, thus effecting a large saving for the industry.

The thanks of the Department as well as those of the beekeepers are due to the management of the Colonial Sugar Refining Company for their willing assistance in the carrying-out of the experiment.

Milking Shorthorn Breeders.—A meeting of the Council of the New Zealand Milking Shorthorn Association was held at the Ruakura Farm of Instruction homestead last month, being presided over by Mr. A. W. Green, this year's president. Some fifty members of the association joined the Council after the meeting, and the party spent the afternoon inspecting the Milking Shorthorn cattle on the farm. The southern breeders expressed surprise at the high quality of the Ruakura stock.

RED MITE AND WOOLLY APHIS ON NURSERY FRUIT-TREES.

CONTROL TESTS AT ARATAKI.

W. H. RICE, Orchard Instructor, Hastings.

EXPERIMENTS were again conducted at the Arataki Horticultural Station to determine the best winter control for red mite and woolly aphis on orchard nursery stock, the tests being on similar lines to those recorded in the *Journal* for April, 1919.

The treatment, given on 5th June, 1919, was as follows :—

Lot 1 : Dipped in red oil, 1–6, 1–8, 1–10, 1–12 ; ordinary dipping, well submerged, then taken out.

Lot 2 : Dipped in oil at same strength as lot 1, but trees submerged for three minutes.

Lot 3 : Dipped in lime-sulphur, 1–6, 1–8, 1–10 ; ordinary dipping, well submerged, then taken out.

Lot 4 : Dipped in lime-sulphur at same strength as Lot 3, but trees submerged for three minutes.

All these treatments were varied by one set being dipped to ground-level only, and another set totally submerged, roots included. The whole of the series was also duplicated to allow of treatment on 24th July. Two-year-old Jonathans were used in all the tests, and one pear and one plum were subjected to each treatment to note the effect on the trees.

Examination of the trees at specified dates showed the following results :—

7th October : Lots 1 and 2, no red mite or mite eggs on oil 1–6 ; eggs only on oil 1–8, 1–10, and 1–12. No woolly aphis showing on oil-treated trees. Lots 3 and 4, mite eggs and aphis showing on all lime-sulphur-treated trees.

3rd November : Lot 1, no mite or mite-eggs on oil 1–6. Live mites and eggs on oil 1–8, 1–10, and 1–12. Aphis showing on oil 1–12. Lot 2, no mite or mite eggs on oil 1–6. Eggs but no live mites on oil 1–8, 1–10, and 1–12 ; no aphis showing. Lots 3 and 4, live mites and aphis showing on all trees treated with lime-sulphur.

13th December : Lots 1, 2, 3, and 4, live mites and summer eggs on all trees. Oil 1–6 trees evidently reinfected. Aphis on all trees, but less on lot 2, oil 1–6, 1–8. Bad on all lime-sulphur-treated trees. It is possible the trees in lot 2 were reinfected with mite from the adjoining trees.

In regard to root-immersion, with apple and pear there was no injury due to such immersion on either date. With plum, root-immersion in oil at any strength tried on both dates retarded bud-expansion by nearly a week, but trees finally burst into growth undamaged. Root-immersion in lime-sulphur did not retard bud-movement.

CONCLUSIONS.

Lime-sulphur has proved useless as a winter control for red mite or woolly aphis.

Woolly-aphis control is best assured by a three-minutes immersion in oil not weaker than 1–10.

Red-mite control cannot be assured with oil weaker than 1–6, even when submerged for three minutes, though all oil treatments retarded hatching of eggs.

Root-immersion of apples or pears is not injurious, either when done as the trees are lifted from the nursery early in June, or later at planting-time late in July.

Plum total immersion in oil 1–6 to 1–12 retards bud-movement fully a week later than dipping only to growth-level at a similar strength. This applies to both dates of treatment.

The results in the main confirm those of the previous year's tests.

Control of Pennyroyal.—Pennyroyal thrives in wet, sour land, and to get rid of it wet places must be drained and steps taken to sweeten the land by liming and general cultivation. It is good practice to grow one or two good smother-crops, such as rape and green oats, before sowing down to pasture. Patches of pennyroyal showing in the new pasture may be killed by spraying with arsenic solution, made up as follows: 1 lb. arsenic, 1 lb. caustic soda, 20 gallons water. To clear pennyroyal from unploughable land the same spray may be used. A heavy dressing of salt and most of the proprietary weed-destroyers will also kill pennyroyal, but it is found that the arsenic preparation is the cheapest. As the arsenic spray is poisonous, stock must be kept off the sprayed pasture until after a good rain.

HARVESTING BOBS WHEAT AT RUAKURA.

WORK FOR THE COMING MONTH.

THE ORCHARD.

THE FIRE-BLIGHT CAMPAIGN.

THE appearance of fire-blight in New Zealand is naturally the cause of considerable anxiety to fruitgrowers, when the highly destructive nature of the disease and the rapid manner in which it has spread in a single season, in the Waikato and other districts of the Auckland Province, are taken into account. As might be expected in the circumstances, more or less scare articles have been appearing in the Press relative to fire-blight, its previous existence in the country, lack of appreciation on the part of the Department, &c. These statements have been mainly based on an erroneous conception of the position and a lack of knowledge as to the habits of the disease itself.

The object of the present remarks is to allay anxiety, so far as such can be done when dealing with what is fully recognized to be a serious menace to the orchard industry, by assuring the public that the Department fully realizes the seriousness of the position, and is doing, and fully intends to continue to do, all that is reasonably possible with a view to relieving the industry of this menace as early as possible. To this end the Horticulture Division is receiving the full support of the Minister and of the Director-General of Agriculture, and is working in the closest co-operation with the Biology Section of the Department.

Mr. G. Esam, who has been for some time Acting Assistant Director of the Horticulture Division, has been placed in charge of the work in the affected area, and has been given full authority to engage all reasonable assistance required to cope with the situation. This work practically means a tree-to-tree inspection in each affected locality, the cutting-out of diseased wood of moderately affected trees, and the destruction of those badly affected, prior to the danger period of next season, which, according to the behaviour of the disease in America, is from the commencement of the flow of sap until the hot weather of the summer sets in, or shortly after the blossoming-period is over.

The hawthorn is no doubt an important as well as an interesting factor in connection with fire-blight. The hawthorn is readily affected, and, owing to its profuse blossoming habit, may hold and transmit the disease by means of insects to other susceptible plants for some time after the initial infection. This, when considered in conjunction with the numerous hedges of hawthorn, may readily account for the erratic spread of the disease in the affected areas. On the other hand, direct information received from the Bureau of Plant Industry, Washington, U.S.A., is to the effect that the hawthorn has not been found to carry "hold over" cankers in that country. This means that the disease

dies out on hawthorn each season, and that it cannot reinfect other plants until it becomes reinfected itself. Although the hawthorn will be closely watched and investigated in order to definitely determine its behaviour in this country, it is not considered advisable to undertake the wholesale destruction of hawthorn hedges, but it is highly essential that no diseased plants should be left in the vicinity of a hawthorn hedge, otherwise a reinfestation to the hedge is likely to occur, with a wider spread of the disease to follow.

Judging from the public statements which have been made from time to time, there appears to be an idea that fire-blight is not new to New Zealand. All the writer wishes to say in this connection is that no evidence has at any time come under the notice of the Department to warrant this supposition. In all cases in the past such cankerous attacks and dying wood of a suspicious character have been submitted to the Biologist for examination. His report that the present is the first case of fire-blight which has come under his notice in New Zealand is amply supported by the behaviour of the present disease when compared with that of any other, however closely such may have outwardly resembled the present disease.

AUCKLAND.

May can be regarded by the orchardist as the close of the fruit season, and attention may be given almost entirely to a general cleaning-up of the orchard, sheds, spraying-apparatus, &c. This work should include the collection and burning of all mummified fruits that may be still hanging on the trees or lying on the ground.

Intending planters are advised to get the work of preparation of ground for planting well in hand. If left until after May the ground will probably be in too wet a state to permit the carrying-out of successful work, more especially on the heavier class of gum lands.

Before all the leaves fall opportunity should be taken to mark any trees affected by silver-blight, so that the desired treatment may be given while they are in the dormant and semi-dormant stages.

Spraying for woolly aphis and San Jose scale on apple-trees may be carried out at the end of May with red oil, 1–25.

Instructions for the control of fire-blight in affected areas have been given elsewhere. —*J. W. Collard, Orchard Instructor, Auckland.*

HAWKE'S BAY.

The marketing of late varieties of apples will still take up a good deal of time. Other seasonable work will be to thoroughly clean up the orchard.

Following such a dry season as we have just experienced, early autumn ploughing should be done as soon as possible, breaking up the land thoroughly to allow easy penetration of all rain and ensure a thorough saturation of the subsoil, thus taking advantage of all rainfall. The land should be ploughed towards the trees, leaving the furrow in the centre of the rows, with the fall of the land to provide an easy get-away for surplus water should the winter prove to be a wet one. Neglect of this precaution creates an altogether undesirable waterlogged area in many orchards, and often a considerable loss of root-system due to decay.

The pruning of stone-fruit trees should be done as soon as the trees are in a fit condition. Pruning may be done any time after the foliage has fallen, and should be carried out so as to avoid a rush of work later in the season, as is often the case when all the pruning is left till well on in the winter.

Spraying: Stone-fruits—Die-back and rust, bordeaux 8–6–40; die-back and rust and San Jose scale, lime-sulphur 1–15. Pears—Blister-mite and San Jose scale, lime-sulphur 1–15. —*W. H. Rice, Orchard Instructor, Hastings.*

NELSON.

With the month of May comes the end of the orchard busy season, and an opportunity to attend to the many odd jobs that are always waiting. The spray engine and pump will doubtless want overhauling and some refitting. The present brief interval is the best time to get this done. Hedges will require trimming and fences to be mended; gateways will need fixing and metalling; there are also private roadways to be mended, not forgetting the water-tables and culverts. This brings one to what is perhaps at this time of the year the most important job of all—drainage. This subject should be well considered and the drains receive their annual cleaning-up. Efficient drainage is one of the main factors in securing a good orchard crop. Washouts and scours will mostly be avoided if this matter is attended to now.

If any planting is to be done this year preparations should be commenced without delay. If the land is in grass, skim it, and allow the herbage to rot before cross-ploughing and subsoiling. As this takes time, begin the job now and give the trees a good start. Shelter and plantation planting will also need consideration. It is useless to complain of the scarcity of timber when the remedy is in our own hands. Pines, gums, spruces, and redwoods grow freely here, as well as the deciduous exotic trees. Why go short of firewood and case timber?

—W. C. Hyde, Orchard Instructor, Nelson.

CANTERBURY.

With the advent of May the picking and marketing season will be almost finished, except for those who have taken advantage of cool storage. In such cases it will be wise for growers to examine the fruit at intervals and place it on the market at the proper time, remembering that no variety will keep in cool store for an indefinite period. This particularly applies to those growers in this district who are storing Lord Wolseleys.

Growers intending to plant new orchards this coming season should spare no efforts to get the land in good order. Subsoil where necessary, and when planting see that only good trees are put in; weak trees are a constant source of trouble and very rarely pay ground-rent. Strong, well-grown yearlings are advised.

May will also see the commencement of pruning operations, especially with stone-fruits. Many growers in this district have been too sparing with the knife, especially on peaches and nectarines, with the result that all fruit is borne at the tops of the trees, leaving bare branches underneath. Stone-fruits, when in bearing, need much harder cutting than pip-fruits, not only to promote good new growth, but to furnish the lower parts of the tree with fruiting-wood.

Any drainage required in the orchard should be attended to, and existing drains cleared out, so as to allow them to work properly during the winter.

—G. Stratford, Orchard Instructor, Christchurch.

OTAGO.

With the exception of woolly aphis, and in some instances red mite, the fight against insect pests will now be over for the season, but as soon as the foliage commences to fall growers will be well advised to turn their attention to preventive measures against fungoid disease of stone-fruits. Chief among these diseases is shothole of the apricot, and in many instances this has also been very prevalent on plums, and to a smaller extent on cherries. Leaf-curl of the peach has also been prevalent. Rust does not appear to have been as bad as in the previous season, but still it has been in evidence. All affected areas will be the better at this time of the year for a dressing of bordeaux, 6–4–40, so as to get as many of the spores as possible now. Where die-back is likely to occur this application is very essential.

The apple crop being a good one, possibly more growers will be placing apples in cool storage than formerly. Grade and pack carefully, eliminating all doubtful fruits and those punctured by insects and other causes. It is not profitable to pay out cool-storage charges on inferior fruit. Despatch the fruit to cool store as soon as it is picked if the maximum results are desired.

Where trees are needed for new areas and replacing, no time should be lost in placing orders for these. In doing so stipulate the trees required—their age, grade, &c. Growers are often too lax in this respect, and much trouble and disappointment could often be avoided if they were more businesslike. A perusal of the nursery regulations will assist planters to get only what they want.

—J. H. Thorp, Orchard Instructor, Dunedin.

POULTRY-KEEPING.

F. C. BROWN, Chief Poultry Instructor.

MANAGEMENT OF THE LAYERS.

On a great many poultry plants May will prove one of the most trying and disappointing months of the year, for the reason that much will be going out and little coming in. It is a time when the difference between good and bad management is most marked. To the man who manages the business properly, rigorously culls out unprofitable stock, has only the best of the second-season hens on hand, has no superfluous male birds, and has a flock of pullets in a laying-condition, the month of May should show a good return over cost of production. On the other hand, to the poultryman who has neglected to cull his inferior stock and does not possess the necessary number of pullets, or, if he has a good flock of these, has overcrowded his houses owing to the larger number of old birds on the plant, next month will probably show a loss instead of a profit.

Of course, even on the best managed of plants the pullets must be chiefly relied upon to lay at this season of the year, as few adult birds in any flock will be in a laying-condition. Therefore, if a good yield of eggs is to be gathered, it is necessary that the pullets should have everything in their favour. In this connection it must be remembered that the birds are being called upon to lay eggs out of their natural season, and therefore must be handled with the greatest care. In other words, artificial conditions must be provided as far as possible in order that the birds may be able to withstand extreme weather conditions and at the same time produce what might be termed an artificial product. In the first place, the houses must be roomy, so that the birds will have ample space to exercise under cover when cold and wet weather conditions prevail. They should be fed in the house at all times, and induced to exercise as much as possible by being compelled to scratch in dry litter for their grain ration. Do not on any account neglect to provide the pullets with as much food as they can eat. The cost of foodstuffs is certainly high, but so is the price of eggs, and the birds will show a handsome profit over their keep if fed to the best advantage. Notwithstanding the high cost of food, the present price of eggs gives every inducement to the poultry-keeper to feed his birds to their maximum capacity. Unfortunately, when food is dear there is always a tendency on the part of many breeders to give their fowls a mere living-diet. This is obviously false economy of the worst form. Indeed, the most important principle in the management of utility poultry is to feed them well from first to last, and it is impossible to overfeed the bird of the laying temperament.

An exception to the latter statement may be made—namely, that it is possible to overfeed if the food is not of the right quality. For instance, the feeding of a nitrogenous material, such as meat or its substitutes, may be easily overdone. Such food is specially demanded for the manufacture of the winter-egg product of the modern fowl, but it should be used with the greatest care. Especially is this so when the meat is included in a mash mixture, as when fed to excess it may easily do more harm than good. The only safe course when

using forcing-foods is to feed them separately, so that each bird may obtain all it requires and no more. Of course, 5 or 6 per cent. of meat-meal, &c., may be added to the morning mash with safety. Where the danger lies is in compelling a bird to eat an oversupply of it in order to secure a meal. Particularly is this the case where young pullets are concerned, as excess of meat is apt to bring on ovarian troubles, such as protrusion of the oviduct, to say nothing of the double-yolked and shell-less eggs that are likely to be produced. The best course is to provide a plain mash made up of pollard, bran, ground grains, &c., and make this as appetizing as possible by moistening it with meat-soup, skim-milk, or hot water. Then if the meat diet and green-stuff is fed separately the birds will have an opportunity of balancing their own ration, and usually they can be depended upon to do this better than we can do it for them.

Even where a meat diet is fed by itself there is always the risk of the birds eating too much of this, with injurious results, if the grain and green-food materials are not supplied with a free hand. In addition to generous feeding, gravel, grit, crushed oyster-shell, and clean water should be always before the birds, while strict attention to cleanliness is of the greatest importance.

Perhaps the main point in managing the pullets that are bred to lay in winter is to prevent them from going into a premature moult. In this connection the worst mistake that can be made is to change the quarters or change the diet, more especially when the bird is commencing to lay. As a matter of fact, any change in the method of feeding and general management is simply inviting the birds to moult. Probably there has been no season in which the false moult has been more prevalent than the present one. This has been due chiefly to too many changes in the system of feeding, owing to the inability of poultrymen to secure an adequate supply of wheat, and thereby having to resort to substitutes for this much-favoured but scarce grain material.

THE MOULTING-PERIOD.

A common weakness of system on many plants at the present time is to reduce the ration of the adult stock merely because they are moulting and therefore not in a laying-condition. It should not be forgotten that producing feathers is often more exhausting and places a greater strain on the bird's system than the production of eggs. It is therefore essential that the moulting birds should be well fed and given every opportunity to maintain their bodily vigour and withstand the strain which the renewing of feathers imposes. In addition to good liberal feeding, the birds should be well housed, and, above all, they should not be subjected to draughts. It is also necessary to protect them from being exposed to cold and wet weather. Never compel them to stand in the cold, wet yard waiting for feeding-time, as such exposure of a half-naked bird must obviously have an undesirable effect on it. As is the case with birds of all ages at this time of year, they should be fed in the house, so that they will secure all the food they require without having to go out into the open on cold, wet days. The moulting process may be assisted by adding to the mash some flowers of sulphur, allowing a tablespoonful for every twenty birds. No care and attention is too good for the moulting hen.

If she has been considered sufficiently good to retain in the flock for another year, then she certainly deserves to be well done by, even although she is temporarily out of action. The amount of care and attention she receives now will largely influence the time when the productive season again commences.

THE APIARY.

G. V. WESTBROOKE, Apiary Instructor.

PACKING FOR MARKET.

THE packing of the surplus honey for market should now be claiming the attention of the apiarist. This is an important matter which has been much neglected in the past. If the producer could see the deplorable condition in which his honey sometimes arrives at the grading-store or local depot after a journey by rail or steamer he would give more attention to its packing. The graders have frequently to complain of lids of tins being off, and where the honey is not granulated a considerable amount is often wasted. The leakage of honey, however, is not the only loss: it results in messing up all the adjacent cases.

There is another and more serious objection to such leakage at this time of the year, and that is the danger of spreading disease where the honey comes from an apiary infected with foul-brood. The writer recently saw a lorry-load of honey arriving at the depot simply surrounded by bees robbing the honey that was leaking from the tins. Assuming that some of this honey contained spores of the bacteria of foul-brood, then the result would be a most serious loss to those who have hives in the vicinity, through the bees bringing home the infected honey.

There would be no occasion for alarm of this sort if the beekeeper would use a little common-sense. The first essential is to see that the tins are strongly made. When they are filled the next care is to make sure that the lids are placed firmly in position. A stout wad of paper or a small block of wood should be placed on the lid of each tin. This will prevent it coming out when once the lid of the case is nailed down. The nailing-down of the case-tops is another matter that requires consideration. Cases frequently arrive at the grading-store appearing as if the intention of the beekeeper was that they should never again be opened. Sometimes as many as sixteen large nails have been driven in the lid, the result being that it had to be smashed to pieces before it could be removed, entailing a new lid for which the beekeeper had to pay, besides the extra time taken up and the waste of nails. Three 2 in. nails at each end should be sufficient to carry the cases to the grading-store, whether by rail or sea. Then, again, where the strapping is done prior to grading it is only necessary to nail this on the two sides and bottom of the cases, leaving the ends of the wire or strapping to lie on top of the tins *under* the case-tops. These will be securely nailed when graded.

Where honey is intended for export it should not be sent to the grading-store until it has granulated firm, otherwise charges for storage will mount up, which would be saved if the honey were kept at home. Honey will not be graded until it is firm.

Another matter the attention of the beekeeper should be directed to is the branding of the cases. These should have the registered number or brand on one end of the case only. In some instances it has been found that the stencil has been placed upside down. This results in needless labour at the store, as in such cases the bottoms of the cases are mistaken for the lids, and so removed, resulting in double work. All these mistakes can be easily avoided by a little care, and both time and expense saved. When consigning honey by rail the consignment-note should be marked "N.Z. Extracted Honey—Locally produced." This will ensure it being accepted at a cheaper rate than ordinary goods.

LATE FEEDING.

Feeding in the autumn is always a matter that requires special care, as at such times there is a grave danger of setting up robbing in the apiary. Perhaps the safest method is to feed only strong colonies, and then in the evening, supplying plenty of empty combs in which to store the syrup, which should be given rapidly or as fast as the bees can take it up. Weaker colonies may then be supplied with frames of stores from these strong colonies, but in transferring frames care must at all times be taken to see that no disease is present. By adopting this method the danger of robbing is greatly reduced.

It is now almost impossible to obtain white sugar, but beekeepers are being supplied with No. 3 grade, which is a light-brown sugar. This will be found to be fairly safe where bees are enabled to have an occasional cleansing flight. There may, however, be a risk in using it for winter stores in the colder portion of the South Island, where for two or three months in the year the bees have no opportunity of leaving their hives. Arrangements have been made by the controlling authority whereby the New Zealand Honey Producers' Association will supply all beekeepers requiring sugar for feeding purposes, whether such beekeepers are members of the association or not.

VITICULTURE.

S. F. ANDERSON, Vine and Wine Instructor.

WINEMAKING OPERATIONS.

LAST month's notes brought the vintage operations up to the stage of getting the newly made wine into the casks. Although, as already mentioned, wine is made good or bad by the methods used and cleanliness observed at that particular stage, the wine cannot be considered safe so long as it is in contact with the lees. After the second fermentation is quite over, and the wine still, the lees, under the

influence of rest and a cool temperature, are deposited at the bottom of the cask. This is the time for the first racking. The settlement of the lees, although influenced more or less by the weather, is fairly rapid with our light New Zealand wines, the time being from two to three weeks. The sooner after settlement they are drawn off the better, as they contain cells of yeast and other germs which, with a rise of temperature, become harmful to the wine.

The state of the weather when this racking is done is an important factor. It should be clear, bright, cool, and quiet. The casks racked into should be sulphured, and the wine pumped into them with as little contact with the air as possible. Wine loses alcohol every time it is racked, but the cooler the weather and more expeditious the transfer the less is that loss. Where the grapes have been well ripened and are in good condition generally the wine may be tolerably clear. A second or even a third racking will be required before it attains its best condition. The intervals between these rackings depend on local conditions, but should be completed before spring, because on the approach of that season nearly all wine moves more or less—that is, a slight fermentation takes place. During that time all transferring of wine from one vessel to another or bottling should be held over. On the wine regaining its proper clear condition it is generally found to be improved. This spring movement is greatest in the new and least in the old wines. The final racking of the new wines is transferring the wine to the casks in the cellar to mature. Subsequent racking may be required, but these are done in the cellar from time to time after fining, &c.

Saving the Lees.—Where the quantity of lees is considerable they should be stored. They will keep an indefinite time when properly casked. Their value consists in the amount of cream of tartar they contain. Fifty gallons of freshly made wine will deposit at least a gallon of lees. Four-fifths of this will be wine, the remaining one-fifth solid sediment containing the cream of tartar. Although there is not at present a sale for this solid sediment, the high price for cream of tartar may make the venture of storing worth while.

The method of saving the lees is as follows: A cask is selected of a size estimated to contain the solid portion after drawing off the wine. Where, say, the vintage has yielded 3,000 gallons, the resulting solid portion of the lees would be approximately 48 gallons. In such a case an ordinary wine-hogshead stood on its end would serve. A hole large enough to admit a good-sized funnel is bored in the head for introducing the lees, then other smaller holes at intervals of, say, 9 in. from bottom to top of the cask. Filling the cask is done at intervals. After putting in each lot a piece of sulphur wick is burned, and the hole closed until the next lot is added. This is repeated with each addition to the contents when some days elapse between the fillings. As the lees settle the wine is drawn off at the smaller holes, the other part settling in a solid mass as the operation goes on. These lees can accumulate till a sufficient quantity is obtained for further dealing with and preparation for market. This consists in drying and bagging up the material.

The wine drawn off from the lees is harsh and not fit to be added to the other wines, nor is it fit for the still. It should be kept by itself to mellow by age.

THE VINES UNDER GLASS.

Excepting the late grapes, such as Gros Maroc, Gros Colman, Pearson's Golden Queen, and Lady Downes, most of the vinehouses are now cleared of their fruit. In many cases these late grapes are rushed on to the market before they are fit, in order to save them from spoiling, because of mealy bug, mildew, drip from leaky roofs, and other causes, often brought about by careless methods. It should be realized when growing plants under glass that the plants are much more dependent on the grower than those living in open air. The houses must be kept in repair, and daily attention given to control of growth, suppression of insect pests, cultivation, &c. Lack of steady and timely attention always results in the vinehouse getting into a condition that gives very greatly increased after-trouble.

THE GARDEN.

W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

GARDEN-WORK at the present time consists mostly in attention to growing crops.

Spinach should be thinned to single plants standing 8 to 10 in. apart. The object is to produce strong individual plants, as the leaves are gathered separately, and the larger they are the more succulent they will be. If growth is not satisfactory give a dressing of nitrate of soda, ¾ oz. per square yard. Keep the surface soil loose by light hoeing.

Turnips intended to stand for late use should be thinned to about 4 in. apart. Those intended for pulling early need very little thinning of the young plants. It can be done by drawing the roots as they become large enough for use, thus obtaining a very large yield.

Cabbages, broccoli, &c., should be moulded up as soon as they have made sufficient growth. Moulding up should be done in a way that will cover weeds growing between the plants as well as those between the rows. The growth of the plants should then cover the ground and practically prevent further growth of weeds.

Celery may be all moulded up now, but this should not be done while the soil about the roots is dry, as after moulding up water cannot reach most of the roots, and the result would be pithy stems. If possible, the trenches should be given a thorough soaking of water. If this is not practicable delay moulding-up till after a heavy fall of rain. The way the moulding-up is done is of considerable importance if the heads are well grown. The soil should be packed very firmly about the lower part of the heads, so as to prevent the stems bulging or bending, which the weight of soil will cause unless it is well packed at the base. There are various methods employed in blanching, such as the use of cardboard collars, strips of strong paper, &c., in which the heads are enveloped before the earth is packed around them. These methods are not necessary for ordinary purposes. It is important, however, to prevent the soil getting to the hearts. This is done by

first tying the heads together with a strand of green flax or rafia, or by making a two-handed job of it, when a man or boy holds the heads together while another throws in the soil. The person holding the heads also uses his hand to pack the soil firm, and this is the most expeditious method. In places where slugs or wireworms are troublesome a good dusting of a mixture of lime and soot should be given an hour or two before beginning to mould up.

Leeks should be sufficiently advanced for moulding-up. Some people still adhere to the old-fashioned way of growing leeks in trenches, an expensive method that has been abandoned by most growers. If in trenches, moulding-up simply consists in filling the trenches. When grown by the method described in former notes there are no trenches. The plants are set deep, and a considerable portion is blanched naturally. An additional length can be blanched by drawing soil up round the plants, the best results being secured by first wrapping each plant round with a strip of newspaper cut about 6 in. wide and secured with a tie of rafia, soil being then drawn up as high as possible.

The sowing of cauliflower, cabbage, onion, and lettuce was advised for the last week in March or the first week in April. Two varieties of cauliflower were advised, an early and a giant kind. Early cauliflowers are very prone to form heads prematurely, when, of course, they are useless. A little extra care can eliminate this bad habit. As soon as the seedlings are large enough to handle they should be pricked off into a plot of good soil, spacing them about 3 in. apart. The pricking-off will cause them to form an extra large number of roots, and tends to promote a future stronger growth than is possible with plants not so treated. This extra shift, though it is an advantage, is not really important for the larger variety, nor for cabbages.

Asparagus.—When the tops are dead, or nearly so, they should be cut down close to the surface of the soil, rather below than above, because the dead tops become hollow, and unless they are covered with soil they afford harbours for woodlice and other vermin. When the tops are cleared off the surface soil may be lightly broken up. Further treatment, manuring, &c., will be dealt with in next month's notes. Any one intending to plant asparagus next spring should select a site for the plantation at once and get it cleared of weeds, particularly any with perennial roots. It is not now the custom to expend a large amount of labour and material in the preparation of beds, clean soil of fair depth and moderately well manured is all that is required. The culture of asparagus is not yet so general as it should be. This is due partly to the reluctance some people have to plant anything that is not immediately productive, and partly to the erroneous idea that it is an expensive crop to grow. The latter idea is quite wrong; it is, in fact, one of the cheapest crops. The only bar to its general adoption is the fact that it occupies the ground permanently and produces but one crop each year. This prevents those with only small cottage-gardens indulging in it, but is no bar where the area is such that a square rod or two can easily be spared. The advantages are that with modern methods it costs little to establish and once established it requires very little attention, and every year it automatically supplies liberal gatherings of the finest of all vegetables at a time when other supplies are always short. It is, in fact, the greatest asset of any vegetable-garden, and no good garden should be without it.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

COW WITH INFLAMMATION OF HEAD-PASSAGES.

H. S. S., Kaipara :—

I have a five-year-old cow which was dehorned in her second year. Last winter I noticed that her breathing was affected, and for the last three months there has been a discharge coming periodically from the stump of one of the horns. This discharge bubbles in sympathy with her breathing, which is very harsh. The inside of the horn appears to be in a diseased state. I shall be glad if you can give me advice as to treatment.

The Live-stock Division :—

The trouble is caused by inflammation extending from the horn-cone to the various sinuses of the head, and also to the lining of the nostrils. This inflammation is accompanied by suppuration, which fills the sinuses with pus, hence the symptoms you describe. It is best treated by opening the cavities where the pus has collected and allowing it to escape; but, as this would require a major operation and the wound to be washed and dressed for weeks afterwards, it is doubtful if the animal is worth the trouble. The animal might be fattened and sold for beef, if otherwise healthy. The carcase, with the exception of the head, would be fit for human consumption.

CHEMICAL TREATMENT OF TREE-STUMPS.

"GLENDYNE," Waimamaku :—

Please advise me as to the procedure for dissolving large stumps and kauri leads with sulphuric and nitric acids, and if this is an expensive way of getting rid of the timber. My section is an old kauri working on which there are a good number of stumps. I have been told that after they go to powder after this treatment the residue makes valuable manure.

The Fields Instruction Branch :—

We would suggest as an alternative treatment the use of nitre (potassium nitrate), as sulphuric acid is now quoted at £22 a ton, and nitric acid, which is difficult to procure at the present time, is much more expensive. Bore a number of two-inch holes into the stumps at a depth of about 6 in. and plug them with nitre. After a week the whole stump may be fired, and the residual ash will remain as a fertilizer. The nitre disseminates through the stump and will cause it to burn readily.

ARSENITE-OF-LIME SPRAY.—LEAF-HOPPER PEST.

F. A. THORNE, Woolston :—

Could you give me some information about arsenite of calcium? Can we prepare it ourselves, and are the ingredients obtainable here at a reasonable figure? I also desire some advice regarding leaf-hopper, which is very prevalent in this district this season.

The Horticulture Division :—

Arsenite of lime (calcium arsenite) is being increasingly used in America. This compound is more burning than arsenate of lead, but it is much cheaper and

appears to be safe on pip-fruits. Warnings have been issued by American authorities against its use on any stone-fruit. Probably a way may be found to render it suitable for all purposes for which arsenate of lead is used. The following is extracted from an American bulletin: "Arsenite of Lime—White arsenic 1 lb., lime 2 lb., water 3 gallons. Boil together for fully forty minutes after boiling-point is reached. As a precaution against burning, slake 2 or 3 additional pounds of lime. Put the milk in 3 or 4 gallons of water and add to the boiling mixture. Strain and dilute to from 200 to 250 gallons for hardy vegetation, such as potatoes. Do not use at all on stone-fruits or on cucurbits. Dilute to 300 or 400 gallons for tender vegetation. It is safer when used in bordeaux mixture."

Leaf-hopper is prevalent throughout the Christchurch district. It was the subject of close observation this year at the Papanui Experimental Orchard, where it was very numerous the previous season. Here the result of the season's operations has been very successful; the fruit-set and subsequent lime-sulphur sprays, at 1–100, kept the pest well under control. The early sprays are the most important, as it is essential that the insect be destroyed in the nymph stage. Once it is winged it is very difficult to reach with the spray.

POTATOES AS PIG FOOD.

A. J. HARRISON, Waikiekie :—

Will you kindly let me know if raw potatoes do pigs any harm.

The Live-stock Division :—

No harm should result from the feeding of raw potatoes to pigs if the potatoes are combined with other foods; but if the pigs are fed solely on a potato diet some harm may occur, as there is reason to believe that raw potatoes contain some poisonous element, which is lost by steaming or boiling. In numerous experiments it has been found that pigs secure better flesh gains by being fed on cooked potatoes compared with those given raw. Potatoes appear to agree with pigs better than any root crops, particularly when the ration is balanced with barley, maize, or skim-milk. Roots (turnips, &c.) should be fed uncooked.

GRASS-GRUB AND WHEAT.

T. J. S. DOHERTY, Methven :—

I would like a little advice on the advisability of growing wheat in a paddock which while in grass this summer has been greatly infested with grub. Will the grub take the wheat when it comes up, as they did the grass, (1) if I sow in May and June, and (2) if I sow in August?

The Fields Instruction Branch :—

If you were to sow wheat this autumn on the land and under the conditions described by you there would be a decided risk of the grass-grub taking the wheat. It would be much safer to sow spring wheat in August, but the grass-grub might even then do a certain amount of damage. This, of course, would depend on what stage the grubs in your land had reached in their life-cycle of development.

An unsigned inquiry from Appleby, regarding cow's milk, cannot be answered unless name is furnished.

FORTHCOMING WINTER SHOWS.

Clutha Valley A. and P. Society: Greenfield, 5th May.
Otago A. and P. Society: 1st to 4th June.
Manawatu and West Coast A. and P. Association: Palmerston North, 22nd to 25th June.

(A. and P. Association secretaries are invited to supply dates and location of their shows.)

REGULATIONS GOVERNING SALE OF NEW-ZEALAND-GROWN FRUIT FOR LOCAL CONSUMPTION.

THE following regulations, relating to the sale of New-Zealand-grown fruit of specified kinds for consumption within the Dominion, have been made under the Orchard and Garden Diseases Act, and came into force on 15th April, the date of their gazetting :—

DEFINITIONS.

1. In these regulations, if not inconsistent with the context,—

"Blemish" includes branch-rubs, scratches, insect-bites, unnatural russeting, bruises, excrescences, sun-scalds, hail-marks, or any other injury detrimental to the appearance of fruit, but does not include spray injury or damage by leaf-roller caterpillar.

"Brand" means to stencil or imprint clearly and legibly.

"Clean" means free from dirt, insect-stains, and spray-stains.

"Director" means the Director of the Horticulture Division of the Department of Agriculture.

"Mature" means having the degree of ripeness suitable for marketing.

"Owner" means any owner, shipper, or consignor of fruit, and includes the agent or servant of any such owner, shipper, or consignor, and also includes, in the case of a company, the managing director, manager, director, secretary, or other principal officer of the company in New Zealand.

"Pack" means to regularly and compactly arrange fruit in a package.

"Package" means any form of container having a capacity of not less than 555½ cubic inches or one-fourth of an Imperial bushel, and includes a container consisting of any number of smaller containers held together by some means to form one.

"Sell" means to exchange for money or barter, and includes offering or exposing for sale, or sending or delivering for sale, or allowing to be sold or offered or exposed for sale.

"Size" when used as a noun means the diameter of fruit measured from cheek to cheek at the widest part, and when used as a verb means to sort according to size.

"Solid red varieties" means any of the varieties of apples included in Section 1 of the Schedule hereto, and any other varieties having a similar colouring.

"Spray injury" means the russeting of, or other injury to, fruit as a result of spraying.

"Striped or partial red varieties" means any of the varieties of apples included in Section 2 of the Schedule hereto, and any other varieties having similar colouring.

"Yellow or green varieties" means any of the varieties of apples included in Section 3 of the Schedule hereto, and any other varieties having similar colouring.

PACKAGES FOR FRUIT.

2. This part of these regulations shall apply only to apples, pears, quinces, lemons, oranges, peaches, nectarines, and plums.

3. No fruit of any of the kinds enumerated in Regulation 2 above shall be sold in packages except such packages conform to one or other of the types of packages hereinafter prescribed for the several kinds of fruit :

Provided that nothing in this part of these regulations shall apply to fruit of the above-mentioned kinds which is sold direct to a factory or works for the purpose of being utilized in the manufacture of any product, or is sold direct to a packing establishment to be there packed.

4. (1.) The packages in which apples, pears, quinces, lemons, or oranges may be sold shall be of one or other of the following types :—

(*a.*) A wooden case having an inside measurement of 10 in. by 11¼ in. by 19¾ in.

(*b.*) A wooden case having an inside measurement of 5 in. by 11¼ in. by 19¾ in.

(*c.*) A wooden case having an inside measurement of 7 in. by 8 in. by 19¾ in.

(*d.*) A wooden case having an inside measurement of 5 in. by 11¼ in. by 9⅞ in.

(*e.*) A package of three wooden trays strapped together, one above the other, each tray having an inside measurement of 11¼ in. by 19¾ in., with a depth unspecified but not greater than is necessary to take one layer of the kind of fruit being packed. The straps shall be of wood ⅜ in. thick and 1½ in. wide, secured to the ends of the trays, two straps to each end, and flush with the sides of the package thus formed.

(*f.*) A wooden crate of any size containing wooden cases having an inside measurement of 5 in. by 11¼ in. by 9⅞ in.

(2.) Packages of the types described in subparagraphs (*a*), (*b*), (*c*), and (*e*) of paragraph (1) of this regulation shall be constructed of timber ¾ in. thick for the ends and $\frac{5}{16}$ in. thick for the sides, tops, and bottoms.

(3.) Packages of the type described in subparagraph (*d*) of paragraph (1) of this regulation shall be constructed of timber ½ in. thick for the ends and ¼ in. thick for the sides, tops, and bottoms.

5. (1.) The packages in which peaches, nectarines, or plums may be sold shall be of one or other of the following types:—

(*a.*) A wooden case having an inside measurement of 5 in. by 11¼ in. by 19¾ in., with a partition ½ in. thick in the centre if desired.

(*b.*) A wooden case having an inside measurement of 7 in. by 8 in. by 19¾ in., with a partition ½ in. thick in the centre if desired.

(*c.*) A wooden case having an inside measurement of 6 in. by 7 in. by 28 in., with a partition ½ in. thick in the centre.

(*d.*) A wooden case having an inside measurement of 5 in. by 11¼ in. by 9⅞ in.

(*e.*) A package of three wooden trays strapped together, one above the other, each tray having an inside measurement of 11¼ in. by 19¾ in., with a depth unspecified but not greater than is necessary to take one layer of the kind of fruit being packed. The straps shall be of wood, ⅜ in. thick and 1½ in. wide, secured to the ends of the trays, two straps to each end, and flush with the sides of the package thus formed.

(*f.*) A wooden crate of any size containing wooden cases having an inside measurement of 5 in. by 11¼ in. by 9⅞ in.

(*g.*) A wooden crate of any size containing any number of punnets.

(2.) Packages of the types described in subparagraphs (*a*), (*b*), (*c*), and (*e*) of paragraph (1) of this regulation shall be constructed of timber ¾ in. thick for the ends and $\frac{5}{16}$ in. thick for the sides, tops, and bottoms.

(3.) Packages of the type described in subparagraph (*d*) of paragarph (1) of this regulation shall be constructed of timber ½ in. thick for the ends and ¼ in. thick for the sides, tops, and bottoms.

6. If any person, at the coming into force of these regulations, has on hand any packages of a different type from those herein specified, or stocks of timber specially sawn for making such packages, he may, on obtaining permission from the Director to do so, use such packages in packing for sale fruit of the kinds referred to in this part of these regulations:

Provided that such permission shall authorize the use of such packages as aforesaid only up to and including the 31st October, 1920.

MARKING OF PACKAGES WITH REGISTERED NUMBER.

7. This part of these regulations shall apply only to apples, pears, quinces, peaches, nectarines, plums, apricots, cherries, oranges, and lemons.

8. Every package of fruit of any of the kinds mentioned in the preceding regulation sold or offered for sale shall be branded with the registered number of the owner of such fruit, allotted as hereinafter prescribed.

9. Every owner of fruit of the kinds set out in this part of these regulations who sells such fruit in packages shall apply to the Director for registration:

Provided that every occupier of an orchard from which fruit is sold or intended to be sold, to whom, at the coming into operation of these regulations, a certificate of registration of such orchard has been issued in terms of the regulations dated the 3rd September, 1917, and published in the *Gazette* of 6th idem, shall be deemed to have applied for registration under these regulations, and a certificate of registration and a registered number shall be issued to him as hereinafter prescribed.

10. The Director on receipt of such application shall without fee register such owner of fruit, allotting to him a registered number, and shall issue to such owner a certificate of registration accordingly.

11. Such registered number may consist of any combination of letters and numerals.

12. No registered number shall be transferred without the consent in writing of the Director.

13. If a registered number has not been used for a period of two years the Director may, after giving one month's notice in writing, cancel the registration of the owner of such registered number, which will then be available for reallotment.

14. The owner of fruit for sale shall brand his registered number in characters of 1 in. block type on one end of each package of such fruit if such package is a fruit-case, or, if not, in some prominent position thereon.

15. No auctioneer or other selling agent shall sell or offer for sale any fruit of the kinds set out in this part of these regulations contained in packages which are not branded with a registered number.

16. No owner shall sell fruit of any of the kinds set out in this part of these regulations in packages which bear any other than his own registered number, and he shall erase or obliterate any other registered number on such packages:

Provided that in the event of the purchaser of any fruit selling the same without removing such fruit or any portion of it from the packages for any purpose, including the repacking of it in the same packages, he shall sell such fruit under the registered number already branded on the packages, without alteration or addition thereto.

17. Nothing in these regulations shall prevent the holder of a registered number using any other design or mark in combination with such registered number for the purpose of marking his packages of fruit, provided the requirements of these regulations in regard to the use of such registered numbers are complied with.

SALE OF FRUIT UNDER OFFICIAL GRADE-MARKS.

18. The following are the official grades in which apples or pears may be classed: Extra Fancy, Fancy, C Grade; and the words "Extra Fancy," "Fancy," and "C Grade" shall be deemed to be and shall be known as official grade-marks.

19. (1.) No apples or pears shall be sold in packages bearing thereon any of the above official grade-marks unless such apples or pears conform to the standards hereinafter set out for the corresponding grades, and unless all the requirements of this part of these regulations are complied with.

(2.) The official grade-marks shall not be applied to fruit other than apples and pears unless and until such fruit is brought within the scope of this part of these regulations.

Apples.

20. The following are the standards by which the grade of apples shall be determined:—

(*a.*) *Extra Fancy Grade.*—Apples of this grade shall be of not less size than 2¼ in., sound, smooth, and clean. They shall be mature, well formed, hand-picked, true to name, and free from disease, spray injury, visible bitter-pit, skin-puncture or skin broken at stem, and other defects. Very slightly blemished apples may be included in this grade, provided that not more than 8 per cent. of the total number in any one package are so blemished. The individual apples of solid red and striped or partial red varieties shall carry not less than 75 per cent. and 50 per cent. respectively of good typical colour. The individual apples of yellow or green varieties shall be of good characteristic colour.

(*b.*) *Fancy Grade.*—Apples of this grade shall be of not less size than 2¼ in., sound, smooth, and clean. They shall be mature, well formed, hand-picked, true to name, and free from disease, visible bitter-pit, skin-puncture or skin broken at stem, and other defects. Slightly blemished apples may be included in this grade, provided that no individual apple shall have more than 5 per cent. of its surface affected thereby. Apples affected by spray injury may also be included in this grade, provided that no individual apple shall have more than 5 per cent. of its surface affected thereby. The individual apples of solid red and striped or partial red varieties shall carry not less than 50 per cent. and 25 per cent. respectively of good typical colour. The individual apples of yellow or green varieties shall be of good characteristic colour.

(*c.*) *C Grade.*—Apples of this grade shall be of not less size than 2¼ in., moderately clean, sound, mature, true to name, free from disease and visible bitter-pit. Blemished apples may be included in this grade, provided that no individual apple shall have more than 10 per cent. of its surface affected by blemish. Apples affected by spray injury may also be included in this grade, but no individual apple shall be distorted thereby. Apples damaged by leaf-roller caterpillar to the extent of 10 per cent. of their surface may be included, provided that the keeping-qualities of the apples so damaged are not impaired.

Pears.

21. The following are the standards by which the grade of pears shall be determined :—

(*a.*) *Extra Fancy Grade.*—Pears of this grade shall be of not less size than 2 in. if pyriform in shape and 2¼ in. if round in shape. They shall be clean, sound, clear-skinned, and of bright appearance. They shall be mature, well formed, hand-picked, true to name, and free from disease, spray injury, skin-puncture or skin broken at stem, and other defects. Very slightly blemished pears may be included in this grade, provided that not more than 8 per cent. of the total number in any one package are so blemished.

(*b.*) *Fancy Grade.*—Pears of this grade shall be of not less size than 2 in. if pyriform in shape and 2¼ in. if round in shape. They shall be clean, sound, mature, well formed, hand-picked, true to name, and free from disease, skin-puncture or skin broken at stem, and other defects. Slightly blemished pears may be included in this grade, provided that no individual pear shall have more than 5 per cent. of its surface affected thereby. Pears affected by spray injury may be included in this grade, provided that no individual pear shall have more than 20 per cent. of its surface affected thereby. Pears having characteristic russeting shall not be deemed to be unfit for inclusion in this grade.

(*c.*) *C Grade.*—Pears of this grade shall be sound, moderately clean, true to name, and free from disease. No individual pear shall be included in this grade which has more than 15 per cent. of its surface affected by blemish.

Packing of Graded Fruit.

22. Prior to being placed in packages the graded apples or pears shall be sized, and only fruit of as nearly as possible the same size shall be packed together in a package.

23. In sizing apples or pears in any particular size for the purposes of packing a variation of not more than ¼ in. above the size in question will be allowed, but no apple or pear shall be included in a package which is of less size than that hereinafter required to be branded on such package.

24. Apples and pears of one grade only shall be packed in each package :

Provided that apples and pears of different grades may be contained in the same package if the official grade-mark to be placed on the package as hereinafter prescribed is that of the lowest grade of apples or pears contained in such package :

Provided further that nothing in this regulation shall be construed to authorize the packing of apples and pears or of different varieties of apples or of pears together in the one package.

25. Apples and pears of Extra Fancy, Fancy, and C Grades may be wrapped, but, if wrapped, new paper having one or both surfaces glazed or some other paper approved by the Director shall be used.

Branding Packages of Graded Fruit.

26. The following particulars shall be branded in characters of not less than ¼ in. and not more than ¾ in. block type on each package of apples or pears sold under any of the official grade-marks :—

(*a.*) The grade of the fruit as determined by the standards hereinbefore set out.

(*b.*) The name of the variety contained in the package. In the event of the variety not being known by the owner the words "Variety unknown" shall be branded on the package.

(*c.*) The size of the fruit contained in the package, determined as hereinbefore provided.

(*d.*) The number of fruit contained in the package.

(*e.*) If the fruit has been picked from trees that have not been planted out in the orchard for at least seven years, the letters "N.K.," signifying that the keeping-quality of such fruit is not reliable.

27. The particulars set out in the preceding regulation shall be branded on the same end of the package as the owner's registered number hereinbefore required by these regulations to be placed on one end of packages of fruit, and no other particulars shall be placed on that end except a design or mark used in conjunction with the registered number as hereinbefore authorized.

28. (1.) The particulars required by the last two preceding regulations to be branded on packages of fruit shall accurately describe the contents of such packages,

provided that a variation of not more than five per package shall be allowed in the number of fruit stated to be in such package.

(2.) If the contents of such packages are noticeably and to the detriment of a purchaser at variance with the particulars branded on such packages, the owner of such fruit shall be deemed to have committed a breach of these regulations.

General Provisions relating to Graded Fruit.

29. An Inspector may at any time examine any package of apples or pears bearing an official grade-mark, for the purpose of checking the grading of the contents thereof as indicated by the grade-mark on the package, and the correctness of the other particulars branded on the packages in accordance with the requirements of Regulation 26 above.

30. If on examination the Inspector is of opinion that the contents of any package of apples or pears are of a lower grade than that indicated by the grade-mark thereon, he shall erase such grade-mark, and shall place on the package a grade-mark indicating the grade which he allots to the contents of the package.

31. If such package is one of a line of apples or pears of the same variety and grade and belonging to the same owner, the grade allotted by the Inspector to the contents of such package shall be allotted to the whole line, and the grade-mark on the remaining packages of the line shall be altered accordingly:

Provided that before altering the grade of a line of apples or pears as aforesaid the Inspector shall examine the contents of at least 5 per cent. of the packages in the line.

32. If on examination the Inspector is of opinion that the contents of any package of apples or pears are of a lower standard than that prescribed for C Grade, he shall erase the grade-mark branded on the package, and no grade-mark shall be allowed thereon.

33. If the grade is altered by an Inspector as aforesaid, all work in connection with the examination of the packages of apples and pears for the purpose of determining the grade, and with the re-marking of packages, shall be done at the expense in all things of the owner of such apples and pears.

Sale of Apples and Pears under Official Grade-marks other than in Packages.

34. It shall not be lawful for the official grade-marks to be used to describe any apples or pears sold or offered for sale unless such apples or pears conform to the standards hereinbefore set out for the official grades.

35. Any apples or pears exposed in premises or places where fruit or produce is customarily sold which bear a label or other method of description in which any of the official grade-marks are employed shall be deemed to be offered for sale under the description of such official grade-mark.

PENALTIES.

36. Every person who commits a breach of any of these regulations shall be liable on conviction to a penalty not exceeding £20.

SCHEDULE.

SECTION 1.—SOLID RED VARIETIES OF APPLES.

Baldwin.	John Sharp.	Quarrenden.
Black Ben Davis.	King David.	Spitzenburg.
Black Prince.	McIntosh Red.	Tasma.
Hoover.	Rokewood.	

SECTION 2.—STRIPED OR PARTIAL RED VARIETIES OF APPLES.

Adams Pearmain.	Cellini.	Duchess of Oldenburg.
Alexander.	Charles Ross.	Duke of Clarence.
Allington Pippin.	Claygate Pearmain.	Edward Lippiatt.
American Horn.	Cliff's Seedling.	Frimley Beauty.
Annie Elizabeth.	Commerce.	Gravenstein.
Beauty of Bath.	Cornish Aromatic.	Irish Peach.
Ben Davis.	Cornish Gilliflower.	John Bull.
Black Twig.	Cox's Orange.	Jonathan.
Bramley's Seedling.	Crofton Pearmain.	Jubilee.
Buncombe.	Delicious.	Kentucky Red Streak.
Carolina Red June.	Dougherty.	Lady Hopetoun.

Lane's Prince Albert.
McLiver's Winesap.
New Rock Pippin.
Nickajack.
Northern Spy.
Peasgood's Nonsuch.
Pomme de Neige.
Premier.
Prince Alfred.
Red Astrakhan.
Rhodes Orange.
Ribston Pippin.
Rome Beauty.
Rymer.
Salome.
Scarlet Nonpareil.
Scarlet Pearmain.
Scarlet Queen.
Senator.
Sharp's Late Red.
Shepherd's Perfection.
Shorland Queen.
Springdale.
Stansill.
Stark.
Statesman.
Stayman Winesap.
Symond's Winter.
Worcester Pearmain.
Yates.
York Imperial.

SECTION 3.—YELLOW OR GREEN VARIETIES OF APPLES.

Alfriston.
Ballarat.
Blenheim Orange.
Boston Russet.
Brownlee's Russet.
Cleopatra.
Colonial Washington.
Crisp's Russet.
Dumelow's Seedling.
Dunn's.
Epps's Seedling.
French Crab.
Golden Pippin.
Gloria Mundi.
Granny Smith.
Hawthornden.
Keswick Codlin.
London Pippin.
Lord Suffield.
Lord Wolseley.
Mobb's Royal.
Newtown Pippin.
Nonpareil Russet.
Pigeonette.
Parlin's Beauty.
Pioneer.
Reinette du Canada.
Rhode Island Greening.
Romanite.
Stone Pippin.
Sturmer Pippin.
Takapuna Russet.
Willie Sharp.
Warner's King.
Yellow Bellefleur.
Yellow Transparent.
Winter Majetin.

FRUIT TRADE WITH NORTH AMERICA.

MR. J. A. Campbell, Assistant Director of the Horticulture Division, reports as follows on this subject :—

"From my own observations and from information received I am of the opinion that a fairly good trade in apples and pears could be done both with British Columbia and the United States. It appears to be the unanimous opinion in official circles and among those engaged in the fruit trade that the demand for both apples and pears is in excess of the supply, and the high prices which these fruits were bringing last year in the height of the season goes to support this contention. The continually increasing demand for practically all classes of fruit in America has not been altogether due to the increasing population, but very largely to an increased consumption brought about by the co-operative movement, the stabilization of the commodity through the introduction of standard-packing laws, and extensive advertising, resulting in a continuously increasing field of distribution. The extensive cool-storage facilities in America, by which means a certain quantity of fruit is carried over every year, have to be taken into account, but in the face of the present high prices the general opinion is that this is not likely to seriously affect the position. However favourable the prospect of a fruit trade with North America may appear, it will be very inadvisable to enter upon it unless every attempt is made to reach the high standard of perfection in our grading and packing which obtains there. Further, with reference to British Columbia, the fact must be fully appreciated that, owing to the stringency of the quarantine laws, loss is practically certain to result from the shipment of fruit which is not absolutely free from disease, particularly codlin-moth."

State Forestry.—Referring to the review of the State Forestry Report of 1918-19, published in last month's *Journal*, due recognition must be given to the recording of many valuable data in past years by the late Forestry Branch of the Lands Department. Specific mention may be made of a comprehensive return of forest areas owned by the State, printed in the publication "Forestry in New Zealand," issued by the Lands Department in 1909.

SALE AND PURCHASE OF WHEAT.

REGULATIONS governing the sale and purchase of wheat were gazetted on 20th March. The system of Government control is continued on similar lines generally to those of the two previous years. Brokers will buy good milling-wheat of the current season at the following prices :—

A. Grown in the South Island elsewhere than in the Provincial Districts of Nelson and Marlborough :—

(1.) Sold for delivery free on board at the nearest port—

In January, February, March, or April, 1920, 7s. 3d. per bushel for Tuscan, 7s. 6d. per bushel for Hunters, 7s. 9d. per bushel for Pearl.

In May, 7s. 3½d. for Tuscan, 7s. 6½d. for Hunters, 7s. 9½d. for Pearl.

In June, 7s. 4d. for Tuscan, 7s. 7d. for Hunters, 7s. 10d. for Pearl.

In July, 7s. 4½d. for Tuscan, 7s. 7½d. for Hunters, 7s. 10½d. for Pearl.

In August, 7s. 5d. for Tuscan, 7s. 8d. for Hunters, 7s. 11d. for Pearl.

In September, 7s. 5½d. for Tuscan, 7s. 8½d. for Hunters, 7s. 11½d. for Pearl.

In or after October, 7s. 6d. for Tuscan, 7s. 9d. for Hunters, 8s. for Pearl.

(2.) Sold for delivery otherwise than free on board at the nearest port—A price equivalent as regards the seller to the prices aforesaid.

B. Grown in the North Island or in the Provincial District of Nelson or Marlborough :—

(1.) Sold for delivery free on rail at the nearest railway-station—The same price as that fixed for good milling-wheat grown in the South Island (elsewhere than in Nelson or Marlborough) and sold for delivery free on board at the nearest port, with an addition of 4d. per bushel.

(2.) Sold for delivery otherwise than free on rail at the nearest railway-station—A price equivalent as regards the seller to the price aforesaid.

Sacks will be paid for, in addition to the above prices, at the fair market value, not exceeding 2s. 4d. for 48 in. sacks and 2s. 3d. for 46 in. sacks.

The varieties of wheat recognized under the regulations are defined as follows : "Tuscan" includes all varieties of Tuscan, also Talavera, Dreadnought, Red Marvel, Federation, Yandalla King, and John Brown ; also all varieties not classed as Hunters or Pearl herein. "Hunters" includes all varieties of Hunters, also Victor, McCallum's, Webb's Challenge, Webb's Standup White, Bordier, Velvetear, Sensation, and Redchaff. "Pearl" includes Pearl, Velvet, and Bobs.

The maximum selling-price of seed-wheat is again 5d. per bushel higher than that of the millers' price for good milling-wheat, and machine-dressed seed is allowed a further addition of 5d. per bushel. A wheat-grower may sell directly to any other grower wheat in quantity not aggregating more than 100 bushels for use as seed by the purchaser.

Fowl-wheat.

In an Order in Council accompanying the regulations the price of this class of wheat is fixed as follows :—

The maximum price of free wheat inferior in quality to good milling-wheat, when sold by the grower, shall be a price equivalent as regards the grower to the Government price of Tuscan wheat for the same month of delivery, less 2d. per bushel.

The maximum price of free wheat inferior in quality to good milling-wheat, when sold wholesale by millers, brokers, or other purchasers from the growers free on board or rail at the nearest port or railway-station on the usual trade terms as established at the date of this Order in Council, shall be the Government price for good milling-wheat of Tuscan variety, delivered free on board or rail at the nearest port or railway-station in the same month, less 1d. per bushel. When sold otherwise than free on board or rail at the nearest port or railway-station on the said trade terms, the maximum price shall be a price equivalent as regards the seller to the maximum price aforesaid.

The maximum price of wheat inferior in quality to good milling-wheat when sold retail for delivery in any month by any person other than the grower shall be the same as the price lawfully payable for similar wheat of Tuscan variety when sold wholesale by millers, brokers, or other purchasers from the growers for

delivery in the same month free on board at Lyttelton on the usual trade terms, with the following additions only to such lawful price—namely, an addition of 15 per cent., together with a further addition of the transit charges actually paid by the retail seller of such wheat.

THE ENSUING YEAR'S WHEAT CROP.

DEALING with the wheat question in a public statement made last month, the Hon. W. Nosworthy, Minister of Agriculture, concluded a reference to next year's position as follows :—

"I have recently learned that some doubt exists in the minds of many farmers as to the price to be paid for the ensuing year's crop—1920–21. In order to make the position perfectly clear I may say that at the conference I had recently with the growers it was unanimously decided to accept the offer I made on behalf of the Government—namely, 7s. 3d. for Tuscan, 7s. 6d. for Hunters, and 7s. 9d. for Pearl, these to be minimum f.o.b. prices. The point which some farmers appear to be in doubt over is the word 'minimum.' These prices are guaranteed minimum f.o.b. prices, which will be adjusted according to market rates ruling at the time. In addition there is the increment of ¾d. per month per bushel for six months on and after 1st May to cover storage, which is an increase of ¼d. over the rate to be paid this season. The question of cost of production has been carefully and exhaustively inquired into by various officers of my Department, and it was on the basis of these investigations that the offers accepted for this and next year's crop were made. On behalf of the Government I wish to make a very strong appeal to farmers to grow as much wheat as they possible can this year in order that sufficient may be produced for the Dominion's requirements, and thus avoid the necessity of going to Australia or elsewhere for supplies. I trust that farmers, when they realize the position, will respond to the appeal of the Government. To my mind, it is a very serious state of things when a young country such as this is unable to satisfy its own wants as far as wheat is concerned."

FARM TRAINING FOR DEMOBILIZED BRITISH OFFICERS.

THE Director-General of Agriculture (Dr. C. J. Reakes) has issued the following statement regarding a scheme for the training in farming operations in this country of British officers who may wish to have such a training :—

"Following the termination of the war, the Imperial Government has adopted a policy of encouraging demobilized officers of a suitable type to take up farming as an occupation in the overseas Dominions. An arrangement has been made under which fifty selected fit men who have held commissions in the Imperial Forces are given some monetary assistance by the Home Government towards learning farming occupations in New Zealand. Later, some who are partially disabled may come along. It is expected that the fit men may begin to arrive at any time, and it is consequently necessary to now make provision for assisting them to settle down and begin to learn farming under New Zealand conditions. The arrangement made by the Home Government provides that they may go through a course at an agricultural college, learn the work on a Government farm, or on a privately owned station or farm approved by the New Zealand Department of Agriculture. At the present time all the available accommodation at the Government farms is occupied by our own returned soldiers, and will be kept available for them as long as is needed, hence it is desired that places be found on sheep-stations or suitable privately owned farms for those incoming learners who decide to learn farming on purely practical lines rather than take a course in scientific agriculture. They should make good settlers later, and thereby do their share in increasing the productivity of the Dominion. It can be quite well assumed that, being learners, they will be willing to enter into suitable financial arrangements with those willing to take them on. I shall be very glad if any station-owner or farmer who would be agreeable to assist in this particular phase of post-war reconstruction work by taking one of these soldier learners on to his place will communicate with me as soon as possible, stating what he is prepared to do. From what little I know I anticipate that they will be prepared to get right into work and do their best, and not look for anything more than the decent and cleanly living-conditions fully deserved by men who have risked their lives for their country, and thereby earned consideration and assistance from their kinsmen overseas."

BOARD OF AGRICULTURE.

THE appointment of the following members of the Board of Agriculture, as from 30th April, 1920, has been gazetted: Sir J. G. Wilson, Messrs. J. C. N. Grigg, E. Hall, and W. Perry (Government nominees), E. Averill (Hawke's Bay), W. B. Grant (Taranaki), D. Marshall (Southland), J. Massey (Auckland), W. R. May (Nelson, Marlborough, and West Coast), A. S. Orbell (Otago), J. H. Perrett (Manawatu), and D. W. Westenra (Canterbury). Sir J. G. Wilson has been named as President and Mr. Grigg as Vice-President of the Board.

SOUTHERN PASTORAL LANDS COMMISSION.

A ROYAL Commission has been appointed to inquire into the questions whether the pastoral Crown lands of the land districts of Canterbury, Otago, and Southland are being leased and utilized in the best manner, and whether the pasturage is deteriorating, and, if so, the cause of such deterioration, and how best to remedy the same and to improve the conditions of settlement of the said lands. The personnel of the Commission is as follows: Messrs. Robert Thomas Sadd (Commissioner of Crown Lands and Chief Surveyor for the Otago Land District), William Blyth Buckhurst (Land Valuer, Christchurch), Dr. Leonard Cockayne (Wellington), and Messrs. Dickson Jardine (pastoralist, of Birchwood, Southland), Robert Scott (farmer, of Kyeburn, Otago), Archibald McInnes (farmer, of Otiake, Otago), and Charles Todd (merchant, Dunedin). Mr. Sadd is to be chairman of the Commission.

LAND FOR RETURNED SOLDIERS.

AN area of 65,300 acres of land, subdivided into eighty-four holdings, was opened for selection by returned soldiers during March. Two pastoral runs in Canterbury were included of an aggregate area of 40,000 acres suitable for grazing, twenty-four holdings of a total area of 3,528 acres suitable for general agricultural purposes, and the remainder was principally mixed farming and dairying land.

During the present month approximately 28,000 acres will be available, subdivided into seventy-six farms, and in addition a small grazing-run of 7,100 acres in Otago will also be put on the market.

Early in May the Tuturumuri Settlement, situated in the Wairarapa district, recently acquired from Mr. V. Riddiford, and comprising an area of 6,162 acres of grazing-country, will be offered by ballot. This settlement has been subdivided into eleven holdings, the areas of which vary from 300 to 900 acres.

The following settlements will also be offered during the next month: Marlborough—Moorlands Settlement, 953 acres, subdivided into six farms; Canterbury—Springwell, 780 acres, subdivided into six sections; and Otago—Wairuna and Tilverstowe Settlements, of a total area of 8,800 acres, comprising twenty sections. In addition two large grazing-runs will be offered in the Otago District.

Large areas of Crown lands are under survey, but although at present it is not possible to fix a date for their opening they will be offered from time to time. The Surveyors are now surveying 156,673 acres in the Auckland Land District alone.

Threshings of Wheat and Oats.—Returns of actual threshings received from threshing-mill owners by the Government Statistician up to 19th April showed that till then 1,048,313 bushels of wheat and 1,844,881 bushels of oats had been threshed out. The average yield per acre in cases where particulars of areas were furnished worked out at 34·54 bushels for wheat and 39·75 bushels for oats. The bulk of the threshings was in Canterbury.